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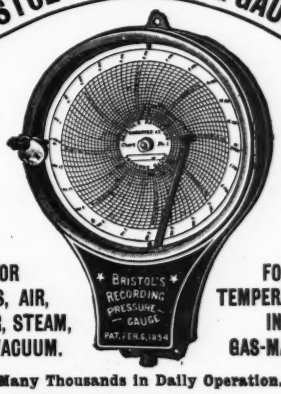

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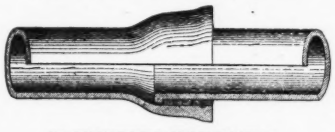

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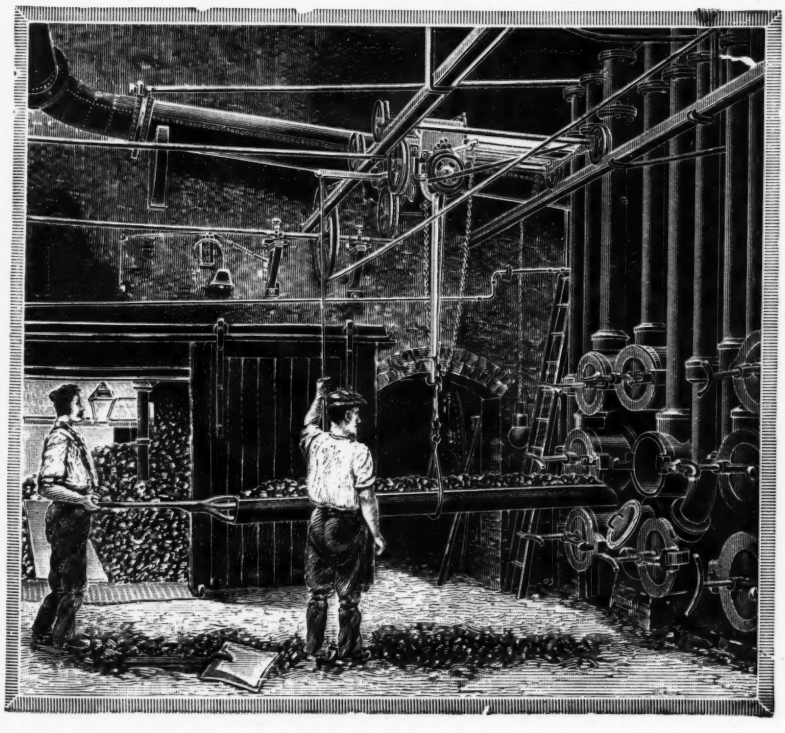

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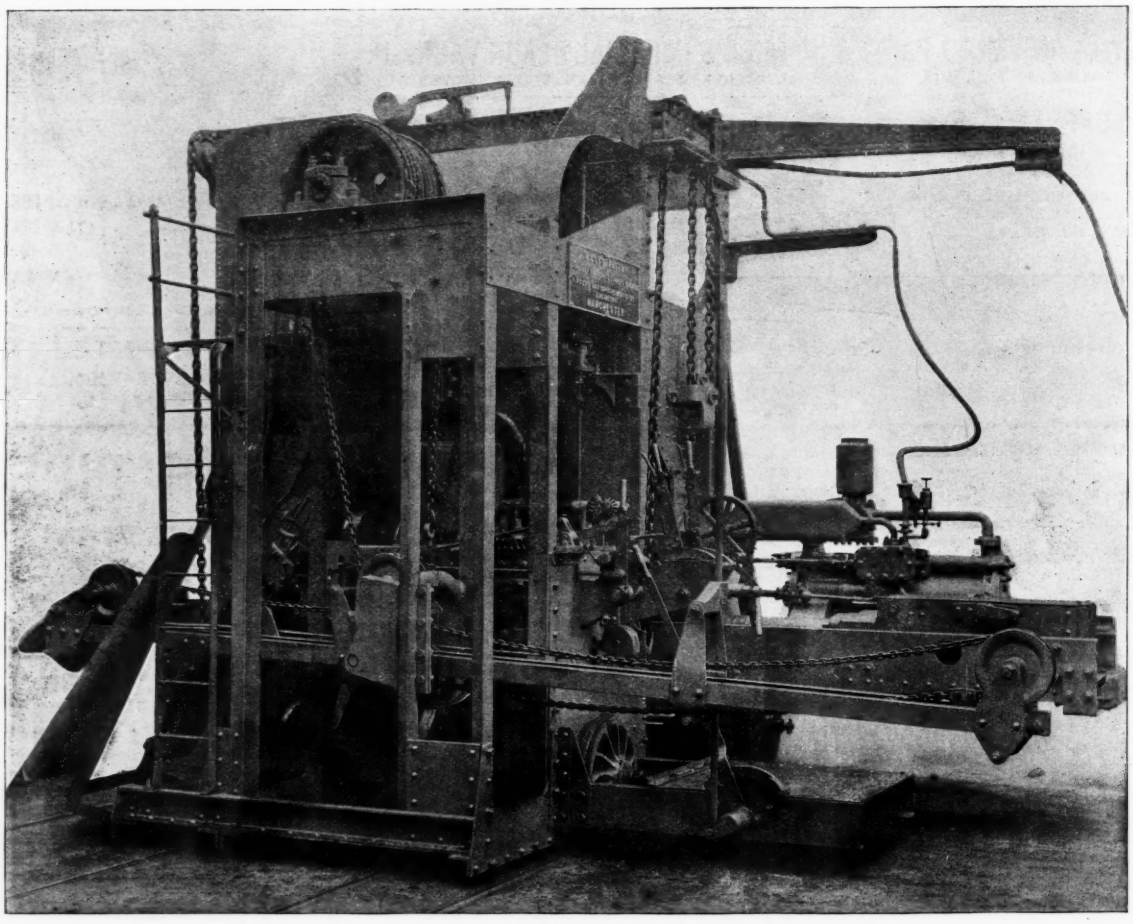

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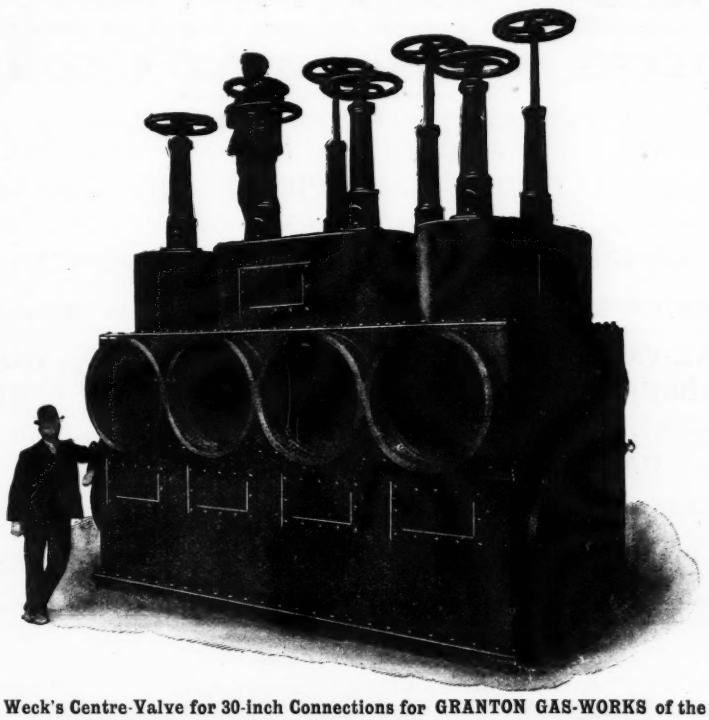

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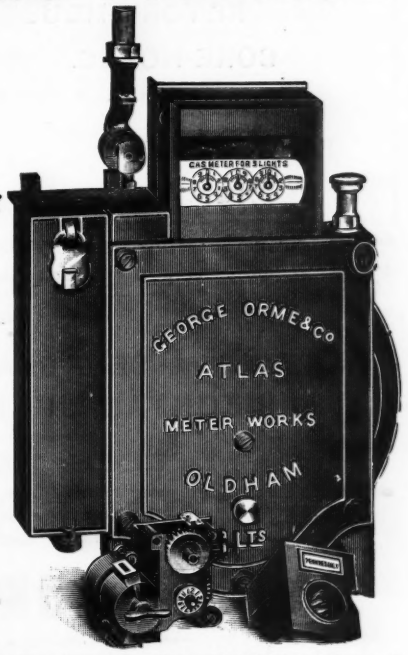

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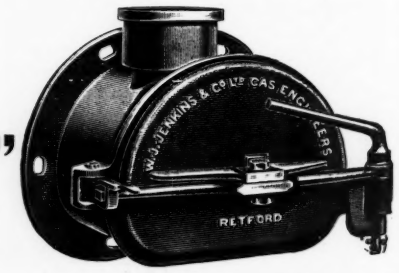

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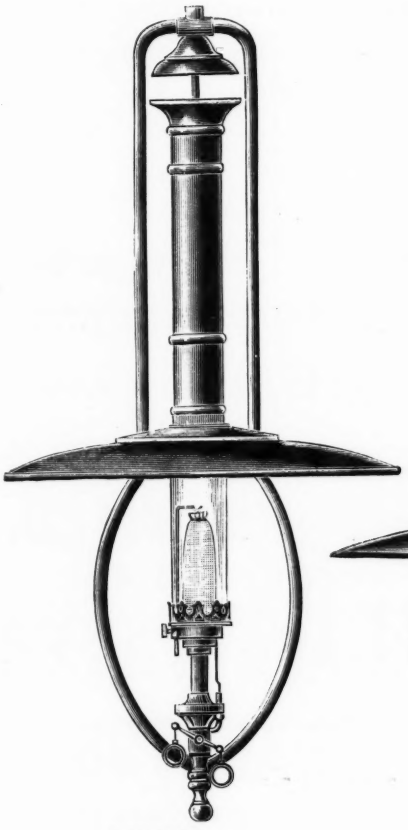

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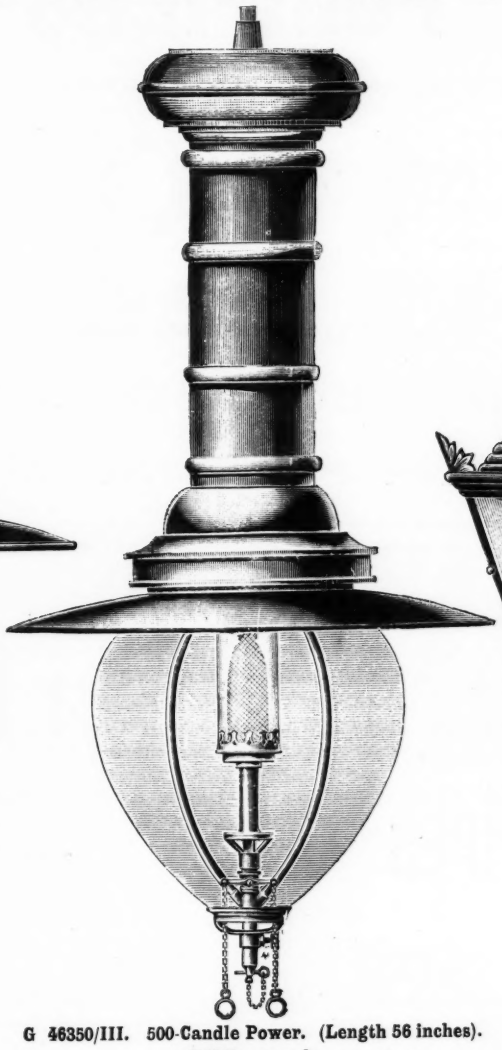

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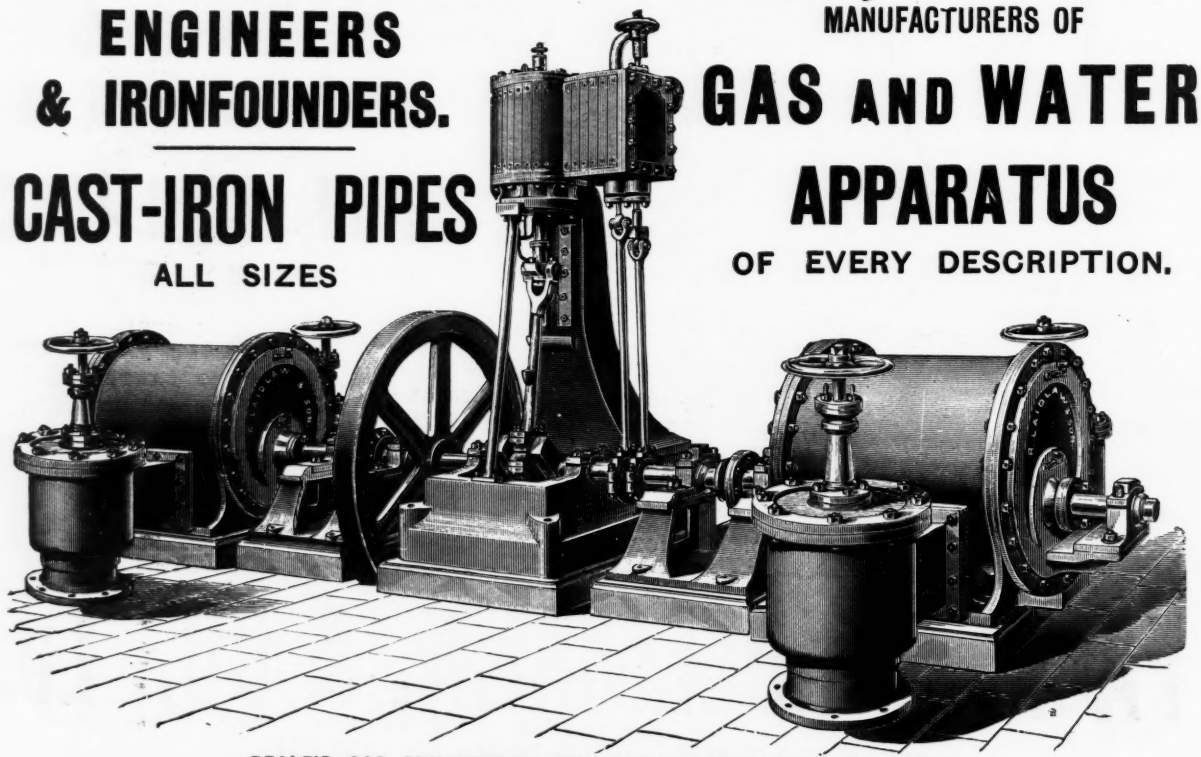

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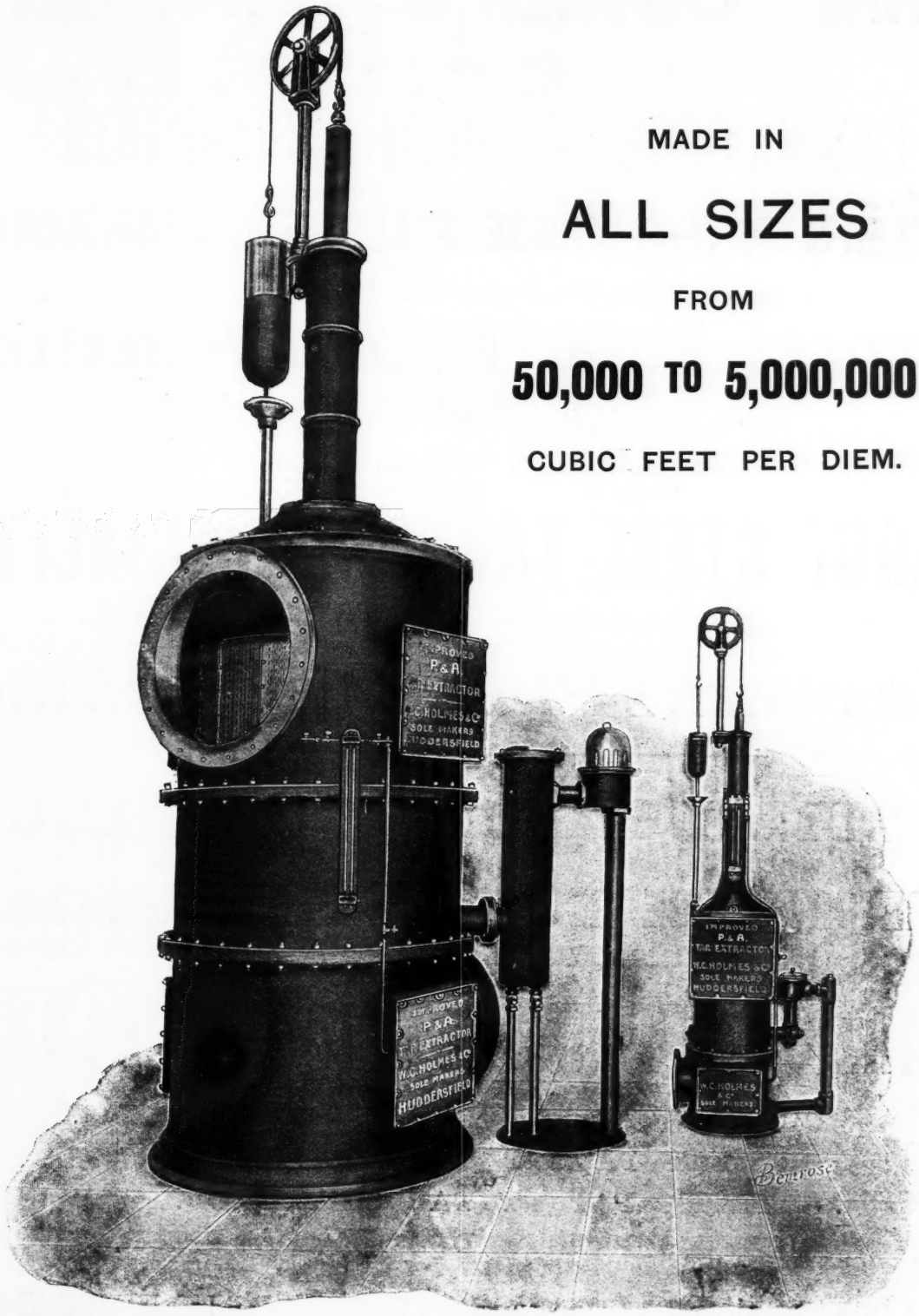

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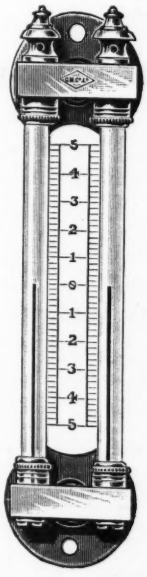

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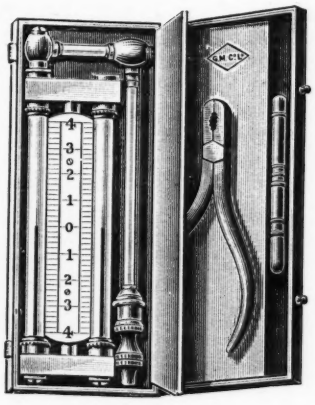

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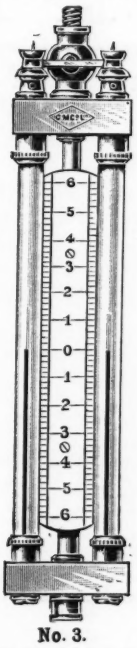

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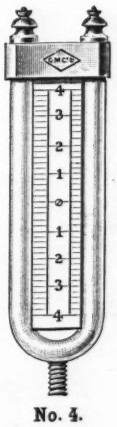

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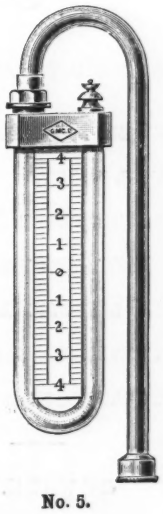

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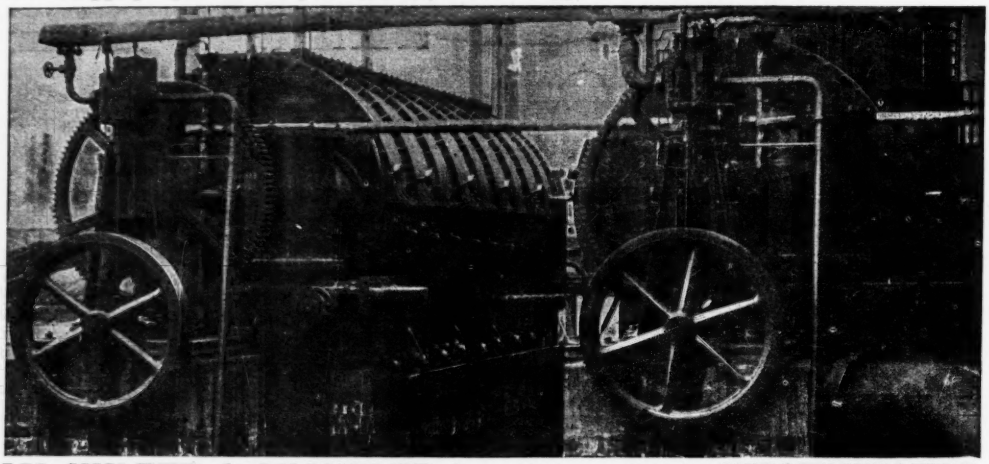

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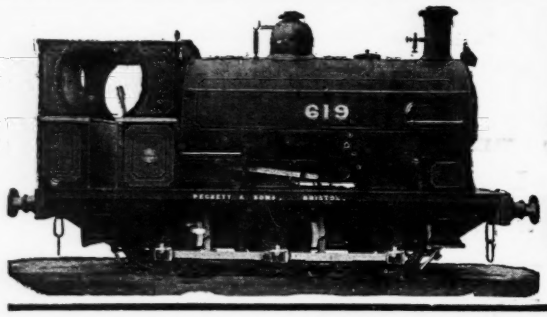

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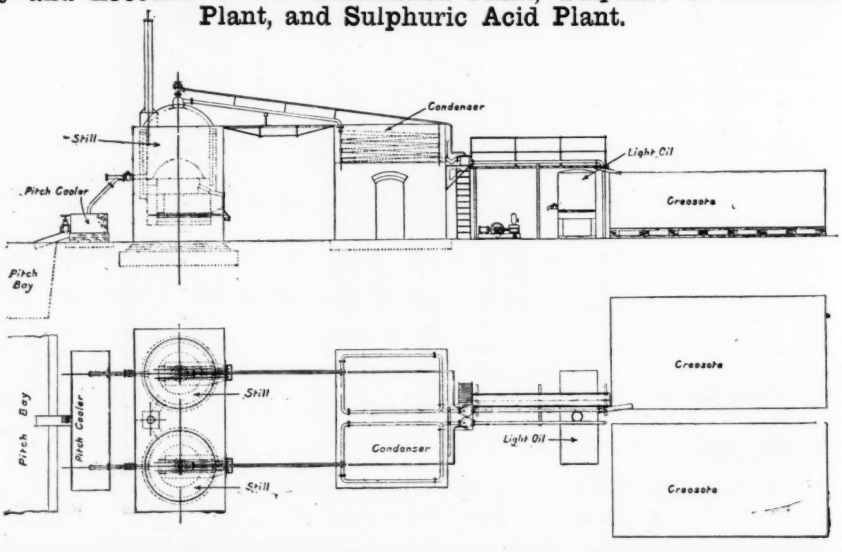

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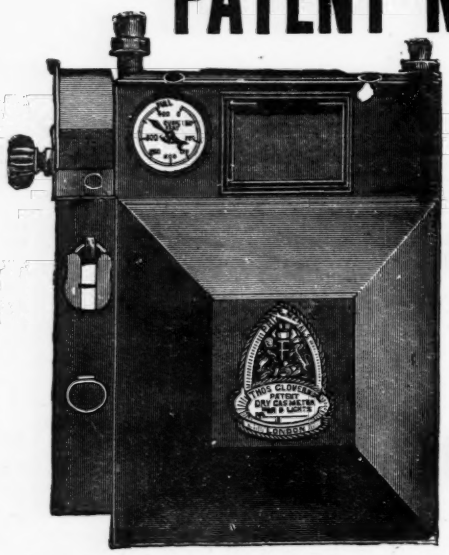

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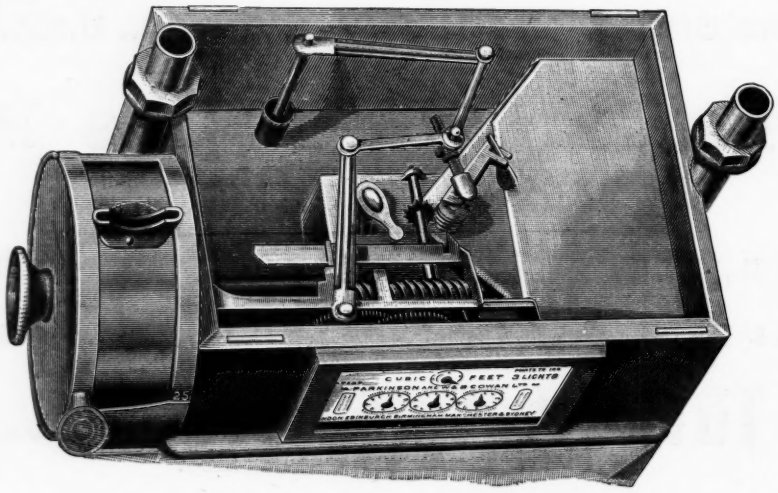

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EDITORIAL NOTES.

Maintenance, Renewals, Depreciations.

ONE of the features of modern Gas Bills, more especially of measures for obtaining additional powers for existing Statutory Companies, which cannot fail to strike readers of the abstracts of this year's Bills in another column, is the frequent appearance of a provision for the formation of a "renewal fund" as a charge upon revenue. Not the least remarkable thing in this innovation—if it can be rightly so termed—is the varying amount of the provision contemplated in different cases. One undertaking will be content if it is allowed to set aside ½ per cent. upon its capital for this purpose; while another wants as much as 1⅓ per cent. The total amount of the proposed fund also varies. It may well occur to students of gas company finance to inquire what all this means. No general answer to such an inquiry has been given; but in order to frame a satisfactory one, it would be necessary to go to the root of the matter, and discuss with particular discrimination the true meaning of the terms profits, depreciation, maintenance, and some other cognate subjects. We should like to get together a professed believer in municipal trading for profits—say, in electricity supply—and a good gas company administrator, and, putting one of these modern Gas Bills into their hands, ask them to say honestly what they really think of the scheme of finance upon which it is based. It would add piquancy to the occasion, if a competent hand at municipalized gas supply according to the most popular models was of the gathering. For the first term in regard to which these respective parties would be found to differ irreconcilably is the first on our list—profits. What is the real profit of an undertaking, such as that of gas or electricity supply, which the administrators thereof can properly dispose of irrecoverably as such? Gas companies exhibit profound differences of practice in this respect. Some bodies of directors habitually divide "up to the hilt," as the saying goes, apparently regardless of the sources of the money. Earnings, reserve fund, unappropriated balance of revenue account, are drawn upon to the last farthing; and when more is wanted, the price of gas is raised to the needed figure. That is to say, the price of gas is dealt with as the real reserve fund of the undertaking. On the other hand, some companies regard the integrity of the reserve fund as the mainstay of their finances, and keep adding to it out of profits that might be lawfully distributed. They prefer to have a "bit in hand," and only raise the price of gas as the last resource. Yet whatever the extent of these differences of practice, the adequate maintenance of a statutory gas undertaking is, with few exceptions, amply provided for. Indeed, in many cases it is overdone; so that structural value is greater than the capital account shows. This is the precise opposite of the state of things currently alleged of the municipal finance of trading undertakings. The problem presented here is, therefore, that of finding the middle way, which must be the safe and proper course. For this is really and truly the end and object of all the arrangements and funds adopted by the most prosperous and provident of gas companies. Everything is rightly directed to maintain the value of the investment at such a figure that by no humanly possible combination of vicissitudes shall the proprietors suffer loss. If more than this is attempted, the public will be unduly burdened; and the statutory privilege will be abused.

The fact of some gas companies asking for sanction to establish renewal funds serves as a reminder that this class of investment is perpetual. Before a prudently administered gas company can see the profit they are at liberty to distribute in the form of dividends on the ordinary capital, they have many calls on the gross revenue balance to satisfy. These need not be enumerated here. We can, however, distinguish among them the charge which is sometimes named depreciation. It is never entered as such in gas-works accounts; and this circumstance seems to have betrayed the Board of Trade into neglecting it in respect to the official form of accounts of electricity undertakings. It is generally asserted and believed that the administrators of these undertakings have improved upon this neglect of the name by ignoring the thing. It is perfectly safe to say that it is never ignored in fact by the great majority of gas companies. There are, it is quite true, unprosperous gas companies struggling in decaying districts who have been unable to keep up the value of their immovable assets; but these can be set off, as regards example, by others who have really done too much in this way. As a rule, well-managed and prosperous companies have their reserves, their insurance fund, and they make provision for the sources of loss of value of the immovable assets known as "antiquation" and "depreciation"—in addition, o course, to making good wear and tear. Only after all this has been provided for out of revenue, as well as interest on borrowed money secured, do they call the rest profit for the proprietors. When a so-called renewal fund is specially created, it is only systematizing what is otherwise effected by the expedient of suspense accounts. The charge is the same. It is one that legitimately comes upon revenue, as part of the working expenses; and it is merely a matter of opinion as to whether or not it should be separately booked. The circumstances of undertakings differ, and so must the policy of their administrators.

Municipalized gas undertakings generally exhibit a great difference from those which belong to gas companies, in respect to reserves. They always treat the price of gas as their immediate reserve, instead of merely as an ultimate or a deferred resource, accustoming their public to alterations from year to year. This policy is quite legitimate, where the supply is conducted as a public service rather than as a money-making concern. In theory, it might be considered that the policy of a Municipal Gas Department should not be affected by the consideration of whether it merely pays its way or contributes to the relief of the rates. In practice, however, there is often a very marked difference. When every member of a large local authority, in his capacity of ratepayers' representative, has a finger in the till of the gas office, it is difficult to regulate the business according to the principles of sound finance. The Municipality becomes as hard a task-master as a Co-operative Society; and none but immediate claims on the revenue balance are recognized. The gas undertaking becomes, as has often been said here, the milch-cow of the corporation; and the animal is not too well fed! Here and there, in different parts of the country, the result of this maltreatment of corporation property is showing itself. Nothing that can be left out is charged to revenue, for fear of diminishing the "profits;" whereas the capital burden is loaded up with a degree of heedlessness that constitutes a public danger of the first magnitude. The result is that municipal trading concerns that have been too profitable are brought within measurable distance of insolvency, simply by the greediness of their administrators.

The word "depreciation" and the thing are unpleasant to the municipal ear. So much was shown recently at a meeting of the York City Council, when the advice of the professional Auditor of the accounts of the Corporation Electricity Department to charge something on this score was ignored. It is the way of local authorities to act in this spirit, which is of a piece with the line of conduct proverbially attributed to the ostrich in face of danger. But it is impossible to get rid of the spectre of antiquation and deterioration by merely ignoring it as a disagreeable object. It will refuse to be exorcised in any such simple and easy fashion. The gasholder will wear out; the retort-house will become obsolete; the boiler will perish; the electric cable will fail. All things grow old, even mayors and aldermen—though the latter do not depreciate. Instead, they retire, and leave their responsibilities to the town, to be liquidated by posterity. Is this quite the right and the worthy thing to do? It were more honourable to discount the day of reckoning. Yet so little is this recognized throughout the country, that a well-known table of municipal electricity supply costs and records has no column for reserve, depreciation, or renewal funds.

Eviction of Colliers at Denaby Main.

THE public have been kept sufficiently well informed during the past week, by the agency of sensation-loving newspapers, that a strike of colliers in a Yorkshire mining district had culminated in "evictions," attended by plenty of such "scenes" as the reporter delights in. Our readers are likely to be better able than most people to see through this kind of sham to the real and sordid facts. "Denaby is becoming "a dreary desolation. Go where one will, there is an air "of despondency, of gloom, of seeming hopelessness. It is "one of the ironies of advanced civilization in the opening "years of the twentieth century"—and so forth. The facts are, that the owners of the Denaby and Cadeby Main Collieries, having been confronted for some six months with an obstinate strike on the part of the men for whom they have provided free housing the while, decided to resume possession of their property as a necessary preliminary to making a fresh start. It is by no means the first time that the same drastic measure has been so forced upon the same colliery owners. Obviously, this is one of the considerations attending the provision of housing accommodation by employers of labour. Those employers who provide cottages for their workpeople near the scene of their labours—a necessary arrangement in many isolated spots—must be prepared to be held up to public obloquy if their men elect to strike, and refuse to leave their dwellings except on compulsion. Such "evictions" are always made the most of by sensation-mongers, who do not scruple to turn against the employers the very failures and follies of their recalcitrant servants. So it has been here.

Whatever the merits of the dispute, it is not denied that the employers have waited patiently for their dissatisfied workpeople to clear out and make room for others, which, naturally, was the last thing they thought of doing. At length, after ample notice, the inevitable ejectments were proceeded with; and then one of the beauties of the Trade Unionism that had been at the bottom of the whole business displayed itself. The strike leaders had not taken the elementary precaution of providing shelter for the families to be dispossessed, whom they had blatantly counselled to hang on to the last. They had had sense enough to arrange for a sufficiency of transport for the goods and chattels put out into the street of the mining village; but after this formality (for it was little more) had been accomplished, it appeared that the Strike Committee had failed to find any accommodation for most of their dupes. Even the sympathizing reporters were forced to confess that there had been some "frightful "blundering." Well might the worthy Primitive Methodist Minister, the Rev. Jesse Wilson, who succoured the hapless women and children, speak scathingly of the quality of the strike leaders, who could look sharply enough after the removable property, but forgot all about the real needs of the people who had trusted to them. It is the old story. Now that scores of humble homes are desolate, and hundreds of breadwinners turned upon the world, the Union leaders rant and pose while the local clergy take round the hat for their victims. It seems a curious way of vindicating the dignity of Trade Unionism. Meanwhile, the old employment will be resumed, but with fresh hands. And there is supposed to be Government machinery for reconciling labour disputes!

The short point of all these Labour questions is that working men must free themselves, or be freed somehow, from the erroneous notion that, on simply joining a Trade Union, they can set at naught all those considerations of responsibility before the law, and the rule of fair dealing as between man and man, which other people must observe. According to the official statement of Mr. W. H. Chambers, the Managing-Director of the Denaby and Cadeby Main Collieries, the strike which has given rise to these picturesque incidents is one of the most senseless on record, "and one which might be described as absolutely ludicrous, "were it not for the disastrous consequences." It originated in a trivial dispute with respect to payment for "bag-dirt," which affected only fifty of the best-paid men in the pit. The owners and workmen not being able to arrive at an agreement, the latter referred the matter to three tribunals of their own choosing—twice to the County Court, and once to a Joint Committee of representatives of colliery owners and the Miners' Union—and in all cases the decision was against the men. The findings were not accepted by the men; and six months ago all the workpeople of the collieries struck work "in sympathy" with the alleged grievance of the fifty. Shortly after the commencement of the strike, the agitators found that the alleged cause was too slight to keep it going; and they therefore stuck on a demand for a new price list which was equivalent to an advance of 28 per cent. on wages, though a general reduction of 10 per cent. was then being submitted to in the Federation districts. The men were told by their leaders that they were objects of pity and derision, although the average earnings had been 9s. 1·55d. per head per day for the previous six months. Now they are begging from people who never earned so much money in their lives. Such wicked folly can only be driven out by the sharpest punishment.

A Notable Recruit for Profit-Sharing.

IN the last issue of the "JOURNAL" was an article commenting upon the conclusion of the visit to America of the Commission of British workmen sent by Mr. Mosely to the United States, to study the conditions—more especially as regarded from the labour point of view—under which the great American industries which compete with British manufactures are conducted. The object of sending this Commission was, we take it, to demonstrate to the British working classes the necessity of their doing a really good day's work for a day's wage, and of offering no obstacles to the introduction and economical employment of machinery, if they did not wish to see trade (which for them means work and wages) pass into the hands of our principal competitor. That this object has been achieved is seriously open to doubt; nor is it easy to see how any really important end could be gained by a hurried run of untrained observers through a large number of shops and works. Impressions so obtained are necessarily superficial; are very likely distorted, more or less, by the medium through which they are presented; and may be very misleading. The one known result of the Mosely Commissioners' visit is that they have decided to recommend the organizations they represent to favour the policy of establishing in this country an institution similar to the American Civic Federation, which is composed of prominent citizens anxious (but by no means necessarily qualified) to intervene between employers and employed when trouble is brewing, in order to prevent a breach of the industrial peace.

We set out fully our reasons for declining to put faith in any such prophylactic for the prevention of strikes, and need not repeat them here. But it is not a little interesting to note that while the article in which we urged our objections and expressed, once again, our belief that the true solution of the great labour problem is to be found in profit-sharing with co-partnership, was in type, a message was published from America in the Daily Press to the effect that the largest employers of labour there (and, probably, in the world), the United States Steel Corporation, have determined to apply that principle to the remuneration of their officers and workmen. Full particulars are not yet to hand; but if the "New York Sun" represents the facts with approximate accuracy—we hope our American friends of the Press will not resent the reservation—the scheme is comprehensive and well considered. It has been pointed out, with truth, that many profit-sharing schemes have been previously tried in America—some with great success, others without ultimately beneficial results. But it is rightly observed that the causes of failure have been, either that the system was tried in a half-hearted, grudging, and inadequate fashion, or that the scheme or its administrators failed to take human nature into account. But, we are assured, the plan of the Steel Corporation will avoid these errors. "It "goes far beyond anything of the kind that liberality or "sagacity ever devised; and we do not think we err," says the "Sun" in its glowing message, "when we characterize "it as the most portentous and far-reaching experiment in "practical sociology the world has ever seen. We think it "must prove almost revolutionary; and that it will be felt "in every great corporate industry in this and other coun-"tries, does not admit of question."

There is in this a characteristic touch of exaggeration; but it is certainly true that, if the great Steel Corporation can successfully introduce, and satisfactorily administer, a profit-sharing system for its vast army of employees, a very remarkable and welcome step will have been taken towards the solution of the labour problems which are threatening to become in the near future much more serious and urgent in the States than they were before the great industrial

expansion now taking place began. And it is equally certain that such a step must, when accomplished, have a considerable influence upon employers and employed on both sides of the Atlantic. We shall await with curiosity further particulars of the scheme, and watch its introduction and progress with great interest. Most heartily we wish it complete and striking success. Such an example would be invaluable, and would do more practical good than half-a-dozen "Civic Federations," however well-intentioned and zealous they might be.

Halifax Town Council and their Gas Engineer.

ALTHOUGH a stronger term might be warranted, we will not be disrespectful to the Halifax Town Council by doing more than describing their position on the gas-works question as a silly one. They had before them a very deliberately worded report some time since relative to the engineering of their gas-works, which report, though unsupported by any independent expert inquiry, was adopted. Condemnatory as the report was, there has apparently been no further movement, or at all events there has been no public announcement of any further movement having been made, in connection with it. There are not many men who would have sat silent under a reputation-tearing document of that character; and on the top of it such a vote as was passed by the Council last Wednesday would, we should think, make even the silent ones' positions altogether untenable. The Gas Committee on Wednesday recommended that a plan be approved for the erection of coal-stores at the gas-works, and that instructions be given for specifications to be prepared and tenders invited for the work. The Committee were satisfied that they were taking the best course. But it was submitted by Mr. J. Parker that the findings of the Gas-Works Investigation Committee a short time ago showed that whatever opinion they might have of Mr. Holgate as a manufacturer of gas, they had no confidence in him as an architect of works; and he argued that no man who voted for the Investigation Committee's report was justified in voting in favour of Mr. Holgate carrying out further extensions of an engineering character. He moved that the matter should be referred to the Borough Engineer; and, by a large majority, this was agreed to. If this is not a vote of "want "of confidence," we do not know what constitutes one. Of all simple structures on a gas-works, surely coal-stores are of the simplest; and if a gas engineer is not equal to work of that kind, then he is not equal to the work of far more importance that comes in his department. If he has not the confidence of his Council in planning such a piece of structural work, then he cannot have their confidence in connection with his more important duties. At the same time, it is a strange proposition that a Borough Engineer should know better than a Gas Engineer what is most expedient in respect of a gas-works coal-stores; but the Halifax Council have accepted it as true in their particular case. Their position is a singular one; and their conduct vexatious. If they have lost confidence in their Gas Engineer in respect of any part of the duties of his office, why do they not say so outright, and not play round the matter by a vote such as they gave last Wednesday? We cannot hold up such tactics for the admiration of, or as an example to, the administrators of the gas industry. The course of the Council's action on a matter which involves so much, has not commended itself to, so far as we have heard, the best of gas-works authority. Whether or not the report of the Investigation Committee and the vote last Wednesday are justified, there are few who would care to say, until the whole question had been submitted to some other tribunal than one in which the complainants are alone the judges, and, moreover, a tribunal qualified to make a pronouncement on such special work.

The Hewitt Electric Lamp.

THE latest candidate for the honour and profit of lighting the streets, railway yards, and similar work-places of the world, was displayed last week in the Westinghouse Building, Norfolk Street, to a presumably admiring company; and inasmuch as all that the Westinghouse firm do is usually widely advertised, it is as well to record here betimes the nature of their newest speciality. Those who happened to be passing the scene of the display could see all there was to look at from the street. This consisted of a number of glass vacuum-tubes, of various lengths—some placed vertically against the wall and some disposed horizontally along the cornice—and giving out an intense, tremulous violet light. This was the Hewitt electric lamp, in which the light is produced by the action of electricity on mercury vapour. It is claimed that the efficiency of the system for the energy consumed is high—about double that of the carbon arc; but the colour of the light is, of course, very much against its use for general purposes. How it would fare in a fog is a question that suggests itself. "Being rich in actinic rays, the light has been "used with success in photographic operations; and it is "thought that it may be found of service in the artificial "stimulation of the growth of plants and in the treatment "of certain skin diseases." Perhaps. What is quite certain is that in its present quality the Hewitt light is unsuitable for most of the purposes for which artificial illumination is required. It is carefully stated in the "inspired" reports of the exhibit that the inventor is "a son of Mr. Abram "Hewitt, and grandson of Mr. Peter Cooper, both distin-"guished citizens" of New York. What this has to do with the value of the invention does not appear. The light has been known by electricians for some time past, but has not entered into their calculations.

Workmen's Compensation Premiums.

It seems that the competition which ensued between the various Accident Insurance Companies on the passing of the Workmen's Compensation Act has resulted in a very large amount of business, especially of the more hazardous kinds, being taken at altogether unremunerative rates. The "Insurance News" remarks that in the absence of an understanding between the offices, competition has run riot; and as a consequence much loss has been, and will still have to be, sustained. This, however, appears now to be generally admitted; and wiser counsels are therefore likely to prevail. The liability under compensation risks is now, of course, becoming more accurately understood day by day; and it is found that it is easier to lose money than to make it out of this class of business. An interesting table prepared by our contemporary shows that the premium income of the thirteen principal Accident Offices has risen in the four years since 1897 from £1,590,000 to £2,878,000. But though the advance in premiums has been on such a colossal scale, it has been derived for the most part from risks of a speculative character, and is therefore proving an incubus. Nothing, it is said, will relieve the situation but revision; and if this is taken in hand in any half-hearted manner, it will not suffice. Though all the offices are financially strong, the business is in such a state that unless there is a marked advance in rates, the percentage of reserves, especially of those offices whose incomes have expanded in the greatest ratio, will rapidly decline. These opinions of the "Insurance News" will be unpleasant alike to the Companies' shareholders and clients. We trust, however, that the higher premiums which are foreshadowed will not apply to gas-workers; and there is some justification for this hope, inasmuch as they constitute one of the least speculative of the risks insured against under the Workmen's Compensation Act.

An Incandescent Hint from Berlin.

The incandescent gas lighting of the City of Berlin is often quoted as an imitable example of street lighting; but our public lighting authorities in many places—there are a few notable exceptions—are slow to move. They go light-heartedly on their way rejoicing in the fact that the incandescent lights that they have are an improvement on what went before; but as to whether they are getting the best possible result from their burners is a matter of total indifference to them. Perhaps want of knowledge as to what can be done is responsible for their inertia in this matter. There is one method in connection with the street lighting of Berlin that we should like to see tried in this country in order to ascertain the effect. One of the open secrets of the highly successful lighting results obtained in Berlin is the constant attention that the burners and mantles receive; and in one important particular—and this is the method we should wish put to the test here—the practice totally differs. The mantles are not purchased in their shapely collodionized state, but are simply bought in the limp, stocking form as impregnated with the lighting fluid. It is held that the second impregnation in the collodion

(which has to be burnt off again before use) has a detrimental effect upon the light-giving value of the mantle, and that it is an unnecessary process in the case of large consumers of mantles. But the limp mantles must, of course, before being used be seasoned and burnt off; and that is an operation that is performed direct by the officials of the Berlin municipal public lighting department. In the seasoning and burning-off room, the mantles are placed straightway on to clean burner heads (a large surplus of these being kept for the purpose), and then the clean mantled heads are placed in boxes specially constructed for safe carriage by the lamp inspectors. A burner already installed bearing a mantle exhibiting the slightest fracture or other defect is condemned, the burner top is removed, and a clean one with a new mantle is slipped on. There are many firms supplying incandescent lighting accessories who would be only too pleased to supply extra burner heads for this purpose; the impregnated mantle stockings should be obtainable at a cheap rate, as the greater part of the labour involved in the making of a mantle comes after the simple impregnation in the lighting fluid; and the necessaries for burning off and seasoning are of a modest character. If any lighting authority makes an experiment in this direction in this country, we should like to hear the result of the experience.

Rhyl's Expensive Luxury.

The proceedings at the adjourned inquiry conducted by Mr. R. H. Bicknell at Rhyl last Tuesday, into an application made by the Urban District Council for power to borrow an additional sum of £11,800, representing their excess expenditure on electric lighting and dust destructor works, brought out several interesting points which may be commended to the attention of the authorities of small towns who are smitten with a desire to have the electric light. First of all, they should consider whether the place is large enough to justify the outlay for an installation; next, they should take care that their plans are matured before estimates are framed as to the probable cost; and, finally, they should refrain from launching out into expenditure for which they have not obtained authority. If these obviously necessary precautions had been taken at Rhyl, the District Council and the officials would have been spared the humiliation of having their actions sharply criticized by two Government officials. Rhyl is a place of 8000 inhabitants, supported almost entirely by visitors; and we do not blame the authorities for trying to make it as attractive as possible. But if more light was desired, why did they not turn their attention to the incandescent gas system, either with or without high pressure? But, no. They had caught the fever, or, as one witness at the inquiry put it, they were "electric light mad;" and consequently it was useless to reason with them. What has been the result? The scheme which was originally to cost £5000 will probably run the town into an outlay of five times this amount. However, according to the Town Clerk, the Council are not despondent, but have great faith in the undertaking. The Inspector found some difficulty in making up the difference between the first estimate and the figures supplied to him; but by the simple process of duplicating the various items, he was fairly successful. Remarking upon the discrepancies, he was informed that when the estimate was first submitted, the plans were not sufficiently advanced to allow of one being prepared—that, in fact, it was only a guess. He advised the official concerned not to make any more guesses, and the Council to consider the advisability of drawing in their horns—two pieces of good advice which are applicable outside this popular Welsh watering-place.

The Height of Meanness.

Happily it is not very often (if we except the small boy who breaks the glass in the public lamps, and the thief who forces open the money-boxes of prepayment meters) that the property belonging to gas undertakings is the object of wilful damage. But it does happen sometimes; and this number of the "JOURNAL" contains the report of an appeal by a Ramsgate engineer against a conviction by the local Magistrates on a charge of this character. The motives of the boy who breaks lamp glasses for "fun" and of the person who robs prepayment meters for profit, it is possible to understand, even though one must condemn them; but it is impossible for anyone possessing a properly balanced mind to appreciate the mental state of a person acting as Thomas Leggett has by two tribunals been adjudged to have done. He was undoubtedly urged on by hatred and malice; but it is the depth of meanness to which these passions drove him that is so difficult to understand. According to the evidence, Leggett had recently been convicted of having infringed the building bye-laws; and by way of revenging himself on the Corporation, who had done nothing more than their duty in bringing him to book, he deliberately went to an empty house for which he was agent, and connected the gas and water pipes, and thus caused £50 worth of damage to the meters in 25 houses. The work was carefully carried out, and no doubt Leggett fancied he was quite safe. But on investigation taking place, suspicion soon fell on the empty house, and bit by bit the deed was clearly brought home to the accused. After the first hearing, we expressed the hope that when the appeal came on he might be able to prove that the Magistrates had taken a wrong view of the case. But there was no weak link in the chain forged by the prosecution; and Leggett while under cross-examination appears to have dissipated any possible chance he may previously have had of securing a reversal of the decision. Leggett cannot be a proud man to-day; and the remark of his own Solicitor at the first hearing, that "a man who would deliberately do a thing like this, who would injure people against whom he owed no grudge, deserved no consideration from anyone," will not tend to make him more so. The legal gentleman who represented him at the appeal said that if the accused had committed the act alleged "he would be fit only for a lunatic asylum." The latter view is the more charitable one; but there seems to have been a great deal too much method in the madness to permit of its adoption. The case is a sad example of what a man will do to gratify his feelings; and the Ramsgate Corporation officials are to be congratulated upon the fact that their enemy has himself fallen into the pit which he had digged for them. Altogether it has been a pretty expensive affair for Leggett, the bill totting up to over £100. It is to be hoped that he will profit by the experience which he has bought so dearly.

The New Gas Tariff in Paris.

As already announced in the "JOURNAL," private consumers in Paris will pay, as from the 1st inst., 20 c. instead of 30 c. per cubic metre (4s. 6d. instead of 6s. 9d. per 1000 cubic feet) for their gas. A difficulty which arose on the question of how the quantity used by each consumer before and after midnight on the 31st ult. should be apportioned on the old and the new basis of price (it being evidently impossible to take the figures at each meter on the night in question) has now been solved. A special list of averages at 30 c. and 20 c. is being prepared, and the quantity of gas indicated by the meter at the next visit of the inspector will be apportioned off according to this list. As from the following monthly visit of the inspector, the gas will be priced at the new rate. Special tariffs will be established for consumers of gas by the hour.

The Reorganization of the Welsbach Capital.

One of the proposals of the famous report which carried the present Board of the Welsbach Company into power was that there should be a large wiping out of the mountainous capital which was the outcome of the various exhibitions of financial jugglery witnessed in the course of a number of years, and which gave to the country one of the huge commercial scandals of the last decade of the old century. It has been stated, in the daily Press, that the Directors have been closely engaged lately in the delicate task of trying to formulate a scheme for the reduction of the capital; and confirmation of this is given us by an authority on the movements in the incandescent world whose information we have reason to fully credit. Since ascending to power, the new Directors have been busy in making some drastic changes in the former hyper-officered staff, in adopting new methods, in lopping off some of the non-paying and heavily capitalized ventures that had been fastened on to the original business, and in curtailing expenditure. In some respects, the wisdom of their decisions may be open to criticism from the point of view of observant outsiders who only wish the Board well in their thankless task of endeavouring to put the concern on a sounder foundation than the huge, breached base that it has been its unhappy lot to occupy. The shareholders have reposed in the Board of their choice a large measure of confidence, and have given

them almost plenary powers in respect of the commercial part of the business; and it is therefore to them that they will have to render an account of their procedure. So far the Directors' reformatory acts have been purely of internal importance; and if the shareholders eventually endorse their efforts to rescue the Company from the ignominious position into which it had fallen, well and good—there will be no ground for outside criticism. But in connection with the question of the monstrous capital, we have always held, and shall continue to hold, that its existence is the sole obstacle in the way of the Directors reducing the price of the Welsbach mantles to the level of the best of the competitors, and so, in a measure—though not so much as before the agreement with the trade and gas undertakings—the public have an interest in that question. The "JOURNAL" has before contended, in the interests of gas consumers, for a reduction of the capital; and the reduction is certainly an indispensable condition to the placing of the Company in better odour with the public.

The Supreme Difficulty.

But forsooth the Directors have left the most difficult task to the end, which seems an egregious mistake. Less than a year ago they had the full sympathy of the proprietors, and this the time that has elapsed may have somewhat cooled. A few months ago, when their disastrous position was fully disclosed, the shareholders might have been found more compliant over any scheme of capital reform than they are likely to be to-day. But this they must at some time or other recognize, that on the whole of the present capital the Company have not the ghost of a chance of ever paying a dividend; and the sooner they realize this, and submit to the shedding of a large part—for large it must be to be of any use—of their holdings, the better will it be for all concerned. But there are the preference shareholders, and it is in that quarter that the greatest opposition to a reorganization of the capital must be looked for; for any scheme to be acceptable all round must involve the resignation of a considerable part of the rights of the preference holders. Theirs is the legal whip-hand; and the success or otherwise of any scheme that the Directors may propose will depend entirely on their will in the matter. It is stated that the Board have been in consultation with some of the largest preference shareholders, and have succeeded in winning them over to a scheme of reform. But the smaller holders compose a section whose voice cannot be ignored; and while there is the likelihood of any pickings from the Company, they will not be unanimous in relinquishing their right to them. The Company are making something in the way of profit; and the preference shareholders will argue that 1 per cent. on £500 is as good to them as 5 per cent. on £100. And better; for while they retain the larger amount of preferential capital, any increment in profit would, of right, until (if ever) their full due was met, fall into their hands. But this is a case in which we do not think they should, in justice to all, strain for their entire legal rights, but should have some consideration for those who have lost so much, and are in a far more hopeless condition than themselves. Large schemes of capital reorganization have been successfully carried through before; and we hope the Welsbach Company will be an addition to the instances. During the past week there was a noticeable recession in the market price of the preference shares; but whether the rumours afloat as to the Directors having seriously tackled this their most dread task are responsible or not for this, we do not know.

WATER AFFAIRS.

Forming the Metropolitan Water Board.

THE Local Government Board have promptly fulfilled the promise contained in their circular-letter of the 23rd ult. (as noticed last week), with reference to the appointment of members of the Metropolitan Water Board by the several Councils grouped as constituent authorities under the Metropolis Water Act, 1902, by issuing an order containing the regulations which, by the terms of the third schedule to the Act, they are empowered to make in regard to the constitution, term of office, proceedings, and place of meeting of each of the Joint Committees to be formed under the Act. The authorities immediately concerned are the grouped Councils in Essex, Kent, Middlesex, and Surrey specified in the scheme for the constitution of the Board contained in the first section of the Act, and already given in the "JOURNAL." These Committees will vary in size from five up to thirty-three members (the latter being the number of the Surrey Councils' Committee), who must all be members of the respective Councils. They will retain their positions upon the Committees until they die, resign, or go out of office as councillors; and though they may be re-elected to the latter office, they will not necessarily resume their seats upon the Committees unless they are again chosen by their colleagues. By this arrangement, no member will remain upon a Committee for more than three years without re-appointment. As soon as the Committees are constituted, the names, addresses, and occupations of the members are to be sent to the Local Government Board, who will then determine the time and place for their first meeting. The first appointments are to be made at a meeting of each of the grouped Councils to be held within six weeks from the date of the order, or such further time as the Board may allow.

The Water Difficulty at Carlisle.

THE circumstances under which, in the spring of last year, the Carlisle Corporation decided on seeking the advice of Mr. James Mansergh on the subject of the water supply of the city will probably be in the recollection of many of our readers. The Corporation found themselves with a scheme upon their hands which they hesitated to proceed with, having lost confidence in the professional gentlemen who had been advising them in connection with it, by one of whom—their own Engineer—it had been designed. After leaving the matter in abeyance six months, Mr. Mansergh was asked to report fully upon the scheme (which, it may be remembered, contemplated obtaining a supply from the Geltsdale watershed), as well as upon the existing supply to the city, and to offer recommendations for its extension and improvement, with estimates of the probable total cost. Mr. Mansergh's firm had the matter under consideration for several months, and the conclusions they arrived at are embodied in a long report which has just been submitted to the Special Committee of the Council appointed to deal with this question. Five schemes are there considered—viz., the Geltsdale, the Mosedale, the Ullswater, a pumping scheme with a reservoir at Durdar, and a modified pumping scheme with a water tower. Only two, however—the Geltsdale and the pumping scheme with a reservoir—are regarded as being worthy of serious attention. As the latter would involve an application to Parliament and to the Local Government Board, whereas authority has already been obtained for the former, Messrs. Mansergh recommend the Corporation to at once set about carrying this one out.

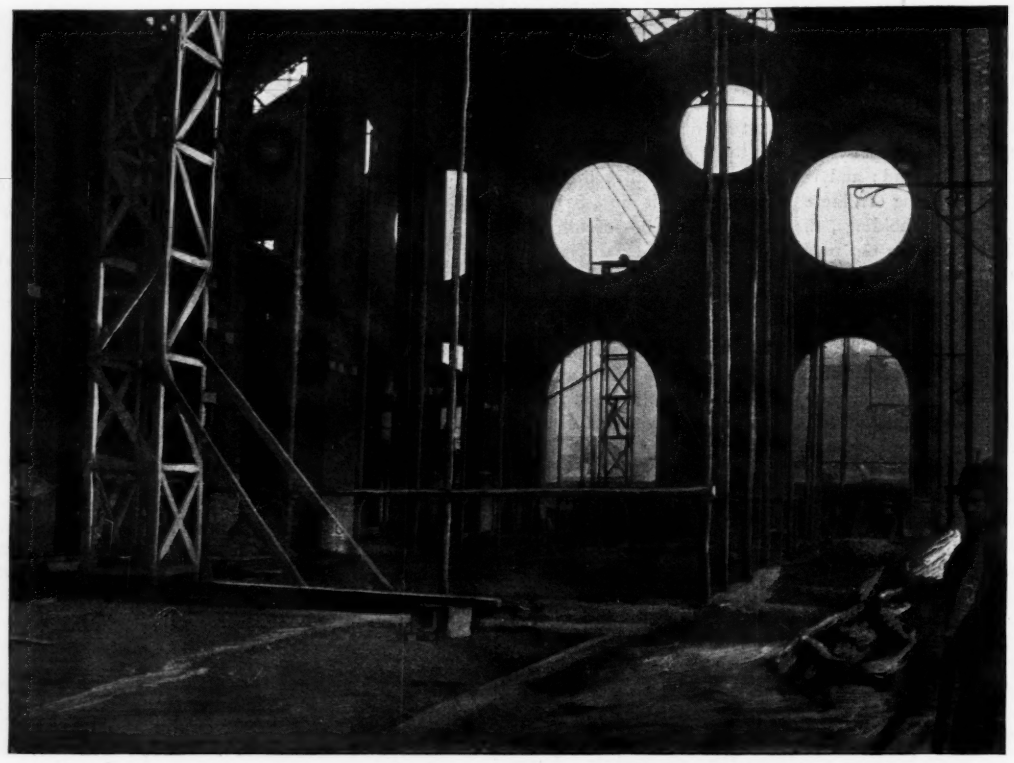
So far as the general design of the Geltsdale scheme is concerned, Messrs. Mansergh consider it to be good; and the works, if carried out satisfactorily, will, with some modifications in detail, in their opinion, answer their intended purpose. The *crux* of the whole matter is the cost. It was here that both Mr. Newton and Mr. Eaton went astray; for while their estimates were £130,000 and £119,000 respectively, that of Messrs. Mansergh is £243,000. This is a serious rise. Nevertheless, it is their "deliberate and "carefully considered advice" that the Corporation should immediately proceed with the scheme. They point out that it would be a retrograde step, after having obtained an Act of Parliament giving them exceptional powers over a "clean "and unimpeachable source, with practically no onerous "obligations," to abandon them now in order to perpetuate pumping from the River Eden. Moreover, the existing works are stated to be in "such a parlous condition, and "such a discredit and danger to the city," that no time should be lost in getting something better. That the works needed improvement, was brought under the notice of the Corporation by Mr. Mansergh in a report that he made ten years ago. The arguments then employed were reiterated by Mr. Newton, and strongly emphasized by Mr. Eaton, in 1897; and their soundness was acknowledged by the application to Parliament by the Corporation in the following year. What was greatly needed in 1893, and was urgent five years later, is of vital importance now; and the best thing the Corporation can do is to show their appreciation of the advice now given to them, by taking the necessary steps to carry out the scheme recommended with as little delay as possible.

AN ENGLISH INCLINED RETORT INSTALLATION IN ITALY.

In keeping pace with the development in adoption of the inclined retort system, we have this week to turn attention to the large installation that has lately been completed at the Milan Gas-Works for the Union des Gaz, with which, as many readers know, the Continental Union Gas Company are practically affiliated. In dealing with these new installations of the inclined system of carbonization, it is always our aim to unearth, for the general benefit and pleasure, their distinctive features, and any points that will awaken curiosity and interest in the work and its future. This Milan installation of inclined retorts and the auxiliary coal and coke handling plant, it is found, possess attractive characteristics—inherent and external; and, being an importation and not native, some of the circumstances attending the rearing of the plant will, in their narration, prove more entertaining to the reader than, we undertake to say, they were at the time to the Contractors, Messrs. Graham, Morton, and Co., Limited, of Leeds. The fact that an English firm obtained the contract for the work in Italy supplies at once a point of interest for all English readers; and, when it is mentioned that the house is the first on the Continent equipped with 20 feet inclined retorts, sufficient has been said to assert its claim to something more than passing notice. Considering the conditions under which the work was carried out, the fact that the Contractors succeeded in completing the building of 32 beds of 20 feet inclines, and in bringing to the working state the whole of the extensive conveying plant rendered necessary by the magnitude of the retort installation, within the space of seven months from the laying of the first brick of the settings, supplies a testimonial to skill and to eminent organization which merits here a word of hearty congratulation.

Difficulties Encountered and Overcome.

Allusion has been made to the difficulties which the execution of a contract encounters so far from the seat of operations; and perhaps of all the western or southern countries of the Continent there is not one that opposes such intestine obstacles to the rapid progress of work of this large character as Italy. We will only mention one of the difficulties. The whole of the material, except a small portion of the fire-clay goods, was shipped from England —the bricks from Glasgow, and the ironwork from Leeds. The



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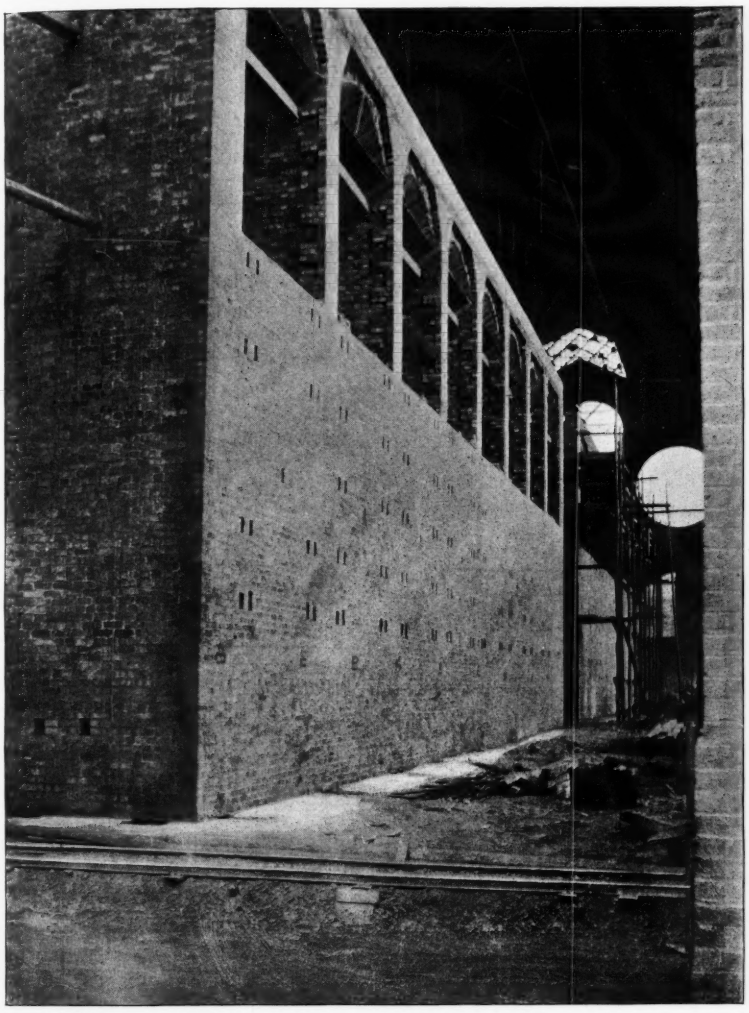
March 1, 1902.—The Day the First Brick of the Settings was Laid.

time occupied in the transmission of the heavy material—from the date of its dispatch to its arrival at Genoa—averaged three weeks for each consignment, including the passing through the Customs. The length of that period was not by any means a matter for complaint; but it was directly the goods arrived at Genoa that the trouble commenced. Even the poignant criticism and sarcasm expended upon the railway companies of this country would not suffice to meet the state of things that exists in Italy. The shortage of railway waggons is a perennial trouble; and this is more particularly felt during the season when the Italian Government take over the waggons for the transport of fruit. However, in this case, Messrs. Graham, Morton, and Co. did their best to get the bulk of their material over before that season arrived. Nevertheless, although only three weeks were spent in getting goods from Leeds to Genoa, as a rule about seven weeks had passed from the date of the start on the journey before their safe delivery in Milan. However, handicapped as the contractors were in this regard, the works were completed in as many months as it took weeks for the passage of each shipment of material.

But there is also another considerable difficulty in the execution of a contract of this kind in a foreign land, and that is with respect to labour and language. The firm, in this instance, took out to Italy sixty of their own trusty retort-setters—men all experienced in the setting of inclined retorts; most of them, in fact, having come direct and fresh from the large performance at Granton. Later on as the installation progressed, and the character of the work changed, some of the retort-setters were replaced by English mechanics. But altogether it may be taken that during the time the sixty English workmen were on the "job" there were over 300 Italian workmen employed; or a proportion of about five Italians to one Englishman. And, on the whole, it must be recorded, they worked together well and with good temper. It is interesting to get an insight into the methods adopted by contractors under such circumstances as these; and although it does not directly come within a descriptive account of the work under notice, we venture to briefly state what was done in this case. The language difficulty was got over by the firm engaging two interpreters—one being allotted to the staff and one to the workmen; and, in addition, ten Italian bricklayers who spoke English were found very serviceable. Also, with the view of rendering the men to an extent independent in this matter of language, the Contractors had specially prepared a *vade mecum* in the form of a dictionary, containing a complete list of words and phrases applying to the various portions of the plant. Then the feeding arrangements for the English workmen were a matter of some concern to the Contractors, who bore the expense of catering for them in the gas-works yard, according to an agreement entered into before the men "signed on." The meals were controlled by two *chefs*. During the first part of the contract, Italian food only was served. But this did not suit nor



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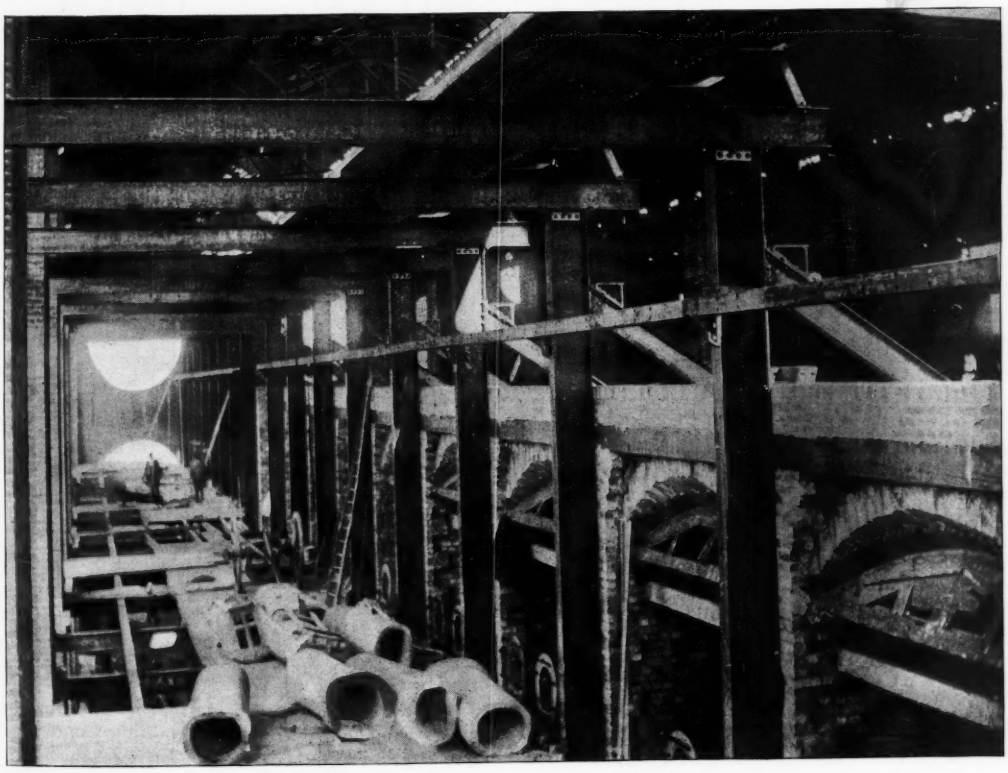
APRIL 15.—SIX-AND-A-HALF WEEKS' WORK.

did it satisfy the English workmen's palate and appetite. It was soon supplanted by English diet. Sleeping accommodation, too, had to be considered; and this was provided in large barracks so that the men were kept together as much as possible. In fact, every reasonable attention was given, and very properly, to the men's personal comfort. Remembering the great variations of temperature experienced in this part of Italy, and considering also the fact that the men were not accustomed to working in such an excessively hot climate, the Contractors had reason to be highly gratified with the manner in which their English employees worked, and particularly, in view of the cheapness of wine in the country, their temperate conduct. In addition to the workmen, there was an engineering and clerical staff of eight persons; and during the execution of the contract Mr. Maurice Graham himself paid no less than twelve visits to Milan in order to inspect the work as it progressed.

These matters show the amount of foresight and organization that are necessary prior to undertaking a contract of this kind and extent so far from the place at which the structural material and parts are produced, and the subsequent active attention to detail required at both ends, to ensure smooth working. But the transport of the material, the manning of the job, the lingo difficulty, and the feeding and lodging of the men do not exhaust the preliminaries to the carrying out of such a contract. There are the Contractors' tools and tackle to be taken from home to the far distant scene of the work; and in this case the value of this plant may be put down as equal to a round £3000. Besides the vast stores, a mechanics' shop had to be fitted up in the yard complete with lathes, drilling-machines, punches, fitters' benches, &c.; and a compressed-air plant, with automatic riveting hammers, drills, &c., had also to be provided. Two steam-cranes—a 5-ton and a 3-ton one—had to be sent from England to Milan; and a system of wide-gauge rails had to be laid so as to bring the railway trucks direct to the spot where the work was in progress. Running round the yard a narrow-gauge railway had also to be



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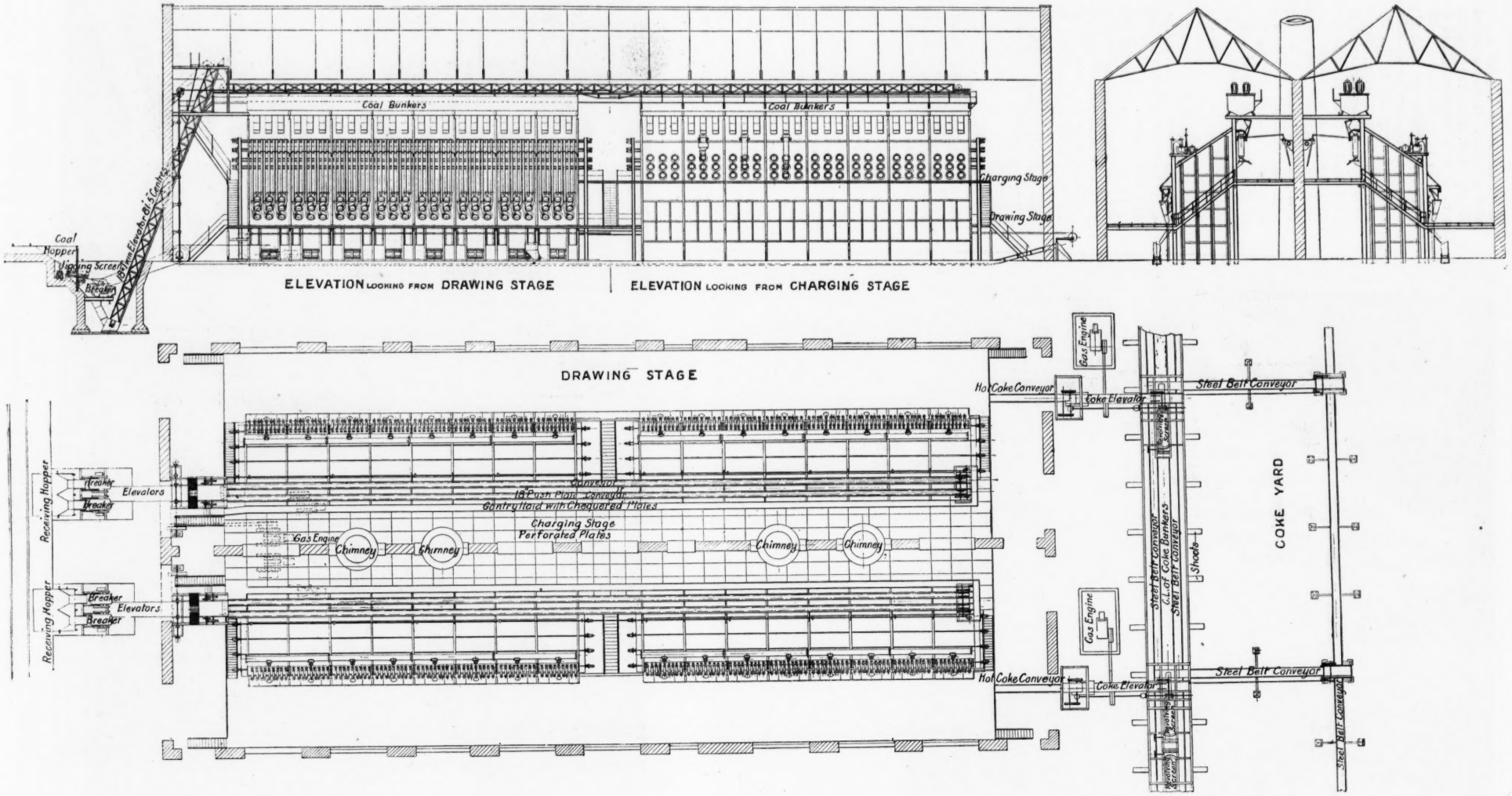
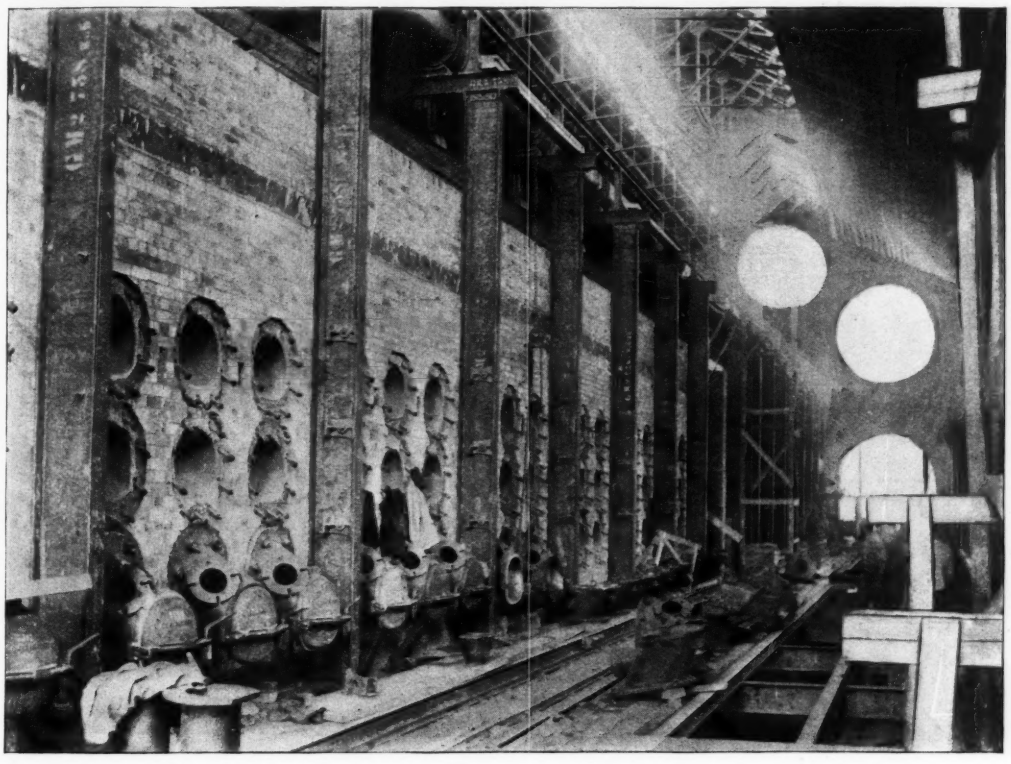
JUNE 19.—POSITION OF THE WORK ON THE CHARGING-STAGE—SETTING THE RETORTS.

THE NEW RETORT-HOUSE AT THE MILAN WORKS OF THE UNION DES GAZ.



ELEVATIONS, SECTION, AND PLAN OF THE INSTALLATION OF THIRTY-TWO BEDS OF INCLINED RETORTS.



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JULY 12.—VIEW OF THE DRAWING-STAGE—THE RETORTS IN.

laid. This is a particularly convenient auxiliary in the case of the building of extensive retort-benches, as the enormous space taken up by the amount of fire-clay material stacked in the yard demands quick and ready means of transport from the yard to the settings. In the erection of the benches, too, the same system as that adopted at Edinburgh was provided for handling the bricks, and raising them on to the scaffolding. Twelve lifts of 4 feet square were fixed at the end of the benches; and the small brick trucks were run from the narrow-gauge railway on to the hoists, raised, and then ran along a narrow-gauge railway fitted to the scaffolding the full length of the benches. By this means sufficient bricks could be raised to enable each man to handle his estimated quantity. The rapid progress of the work will be observed by a glance at the dates appended to the photographic illustrations.

DESCRIPTION OF THE INCLINED INSTALLATION.

The contract which Messrs. Graham, Morton and Co. obtained

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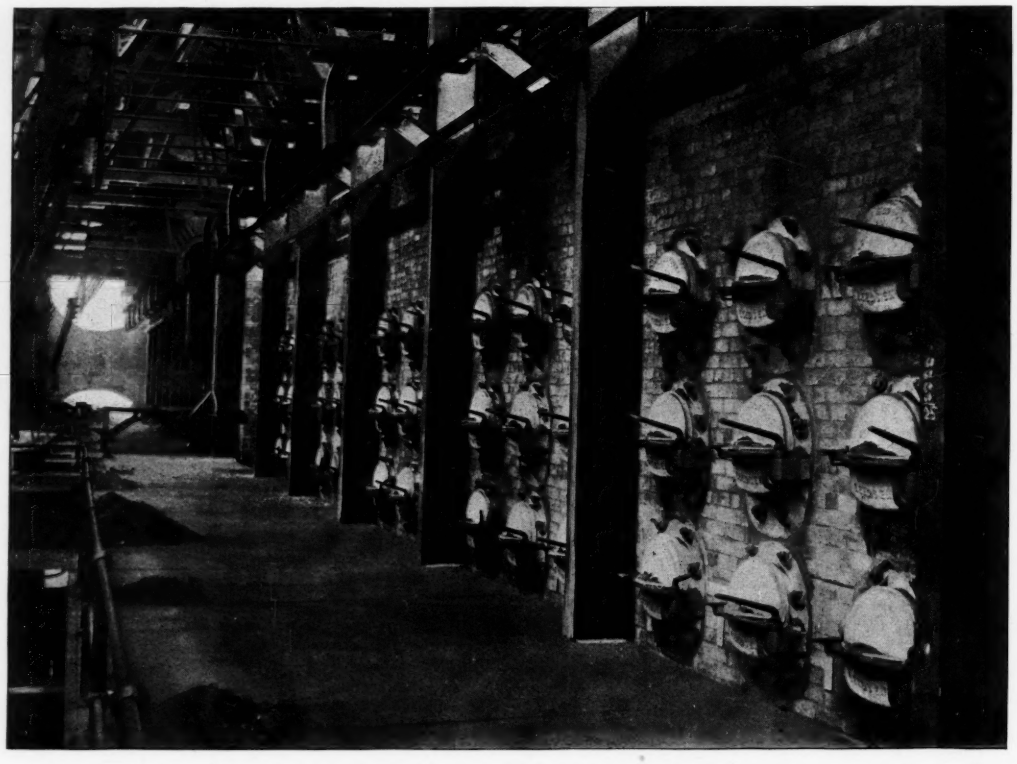
JULY 28.—AFTER A FURTHER SIXTEEN DAYS.



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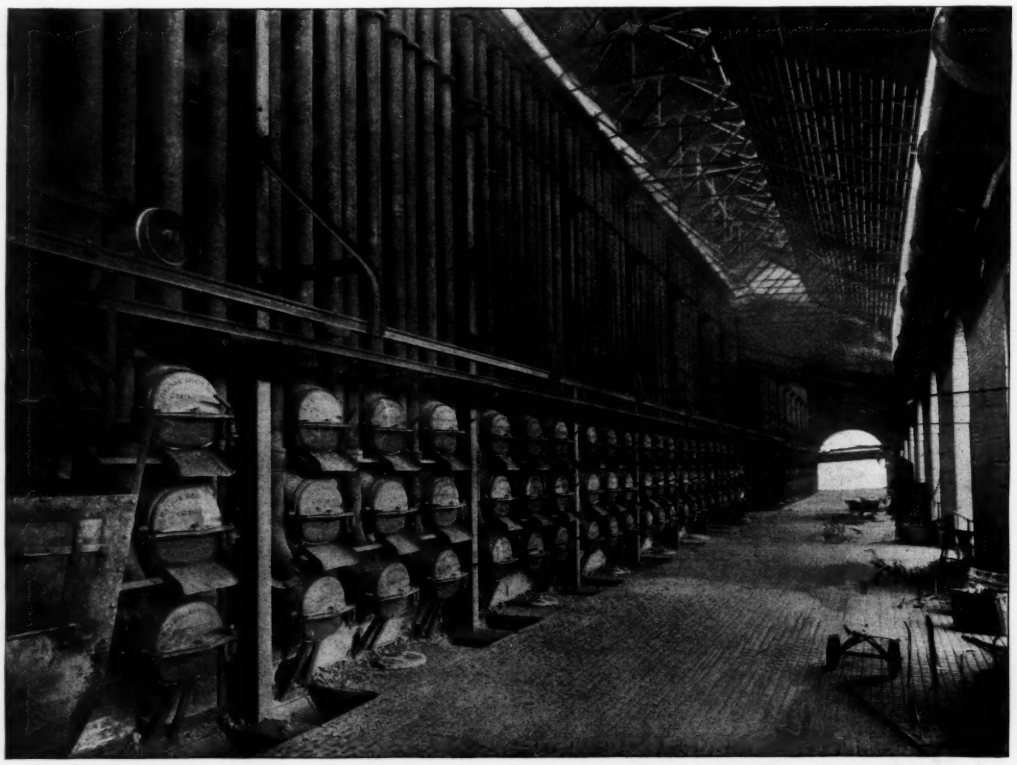
OCT. 1.—SEVEN MONTHS AFTER THE FIRST BRICK WAS LAID: GAS BEING MADE.

comprised the equipment of what are to all intents and purposes two complete houses (each being 254 ft. 3 in. long by 55 ft. 9 in. wide inside the walls, which are 49 feet in height), together with the complete coal and coke handling plant. In each house are erected 16 beds of nine retorts each; so that in all the new installation consists of 288 retorts. Between the two long lines of settings runs the charging-stage, which is the link connecting the two houses. This will be clearly seen by the drawing, p. 88. The house itself, which was built by a local contractor, is of the ordinary local yellow brick, with iron roof, and covered with local tiling; there being no attempt whatever at ornamentation. Incidentally, it may here be mentioned that, adjoining the new installation, is one of sixteen beds of inclined retorts; but these are only half the length of the new comers. The foundations for the settings were constructed by the Gas Company; and for all above those foundations—from the designing



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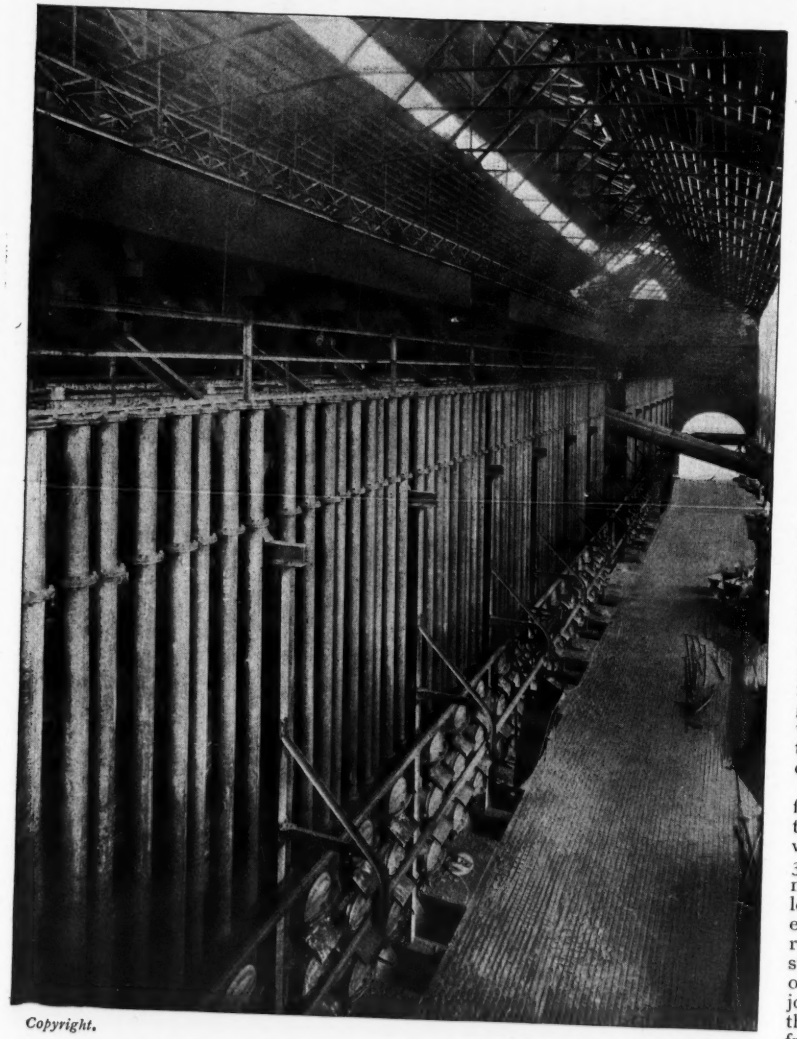
THE DRAWING STAGE—SHOWING TRAVELLING COKE-SHOOT ON LEFT-HAND SIDE OF VIEW.

of the work to its execution—Messrs. Graham, Morton, and Co. were entirely responsible. As stated in the introductory paragraphs, the whole of the ironwork was shipped from England; and the larger portion of the bricks from Scotland—the inside material for the furnaces, as well as the retorts, being obtained from Messrs. Lachomette, of Lyons. These retorts, we have heard engineers experienced in Continental work say, are of the finest to be obtained in the world. They are made by hand, of ground fire-bricks and fire-clay. The furnaces are of Messrs. Graham, Morton, and Co.'s special design, and are so arranged that the bottom bull's eye does not receive any heat by induction from the producer. The consequence is that there is no possibility of it being burnt out as in the old style of settings of nines. The arches are 12 feet centres. The retorts are of D section, with slightly inclined sides, so that the roof of the retort is wider than the floor, which again is slightly dished. Then the retorts are longitudinally tapered just sufficient to assist the discharge of the coke—in fact, they are, save for the curved bottom, similar to the Edinburgh pattern. At the charging end, the retorts are 1 ft. 6 in. wide, narrowing down to the floor to 1 ft. 4½ in. The extreme depth is 1 ft. 4¼ in. At the drawing end, they are 1 ft. 10 in. wide, narrowing down to the floor to 1 ft. 8½ in.; so that the taper to the sides is the same as at the top end. The depth of the retort is the same throughout its length; but the width increases by 4 inches. Before leaving the brickwork, it may be mentioned that each bench of eight beds has its own chimney; so that the house is fitted with four chimneys altogether. These are located, as will be seen on the drawing, in the centre of each half of the drawing-stage.

Regarding the ironwork and fittings of the benches, the longitudinal tie-rods are provided with buffer-springs, which allow 3 inches expansion at each end, making 6 inches in the total length. The end buckstays are each made up of two 15 in. by 6 in. rolled-steel joists; four buckstays, fastened together by means of horizontal 6 in. by 5 in. steel joists, comprising the bracing for the ends of the benches. The front and back buckstays are of 16 in. by 6 in. rolled-steel joists. The front mouthpieces are braced and supported by means of H irons; but there is no bracing and support to the top mouthpieces, as it is not considered necessary. The cross bracing is composed of 10 in. by 6 in. rolled-steel joists; and at the lower end a horizontal bearer 8 in. by 6 in. is fixed, so as to carry



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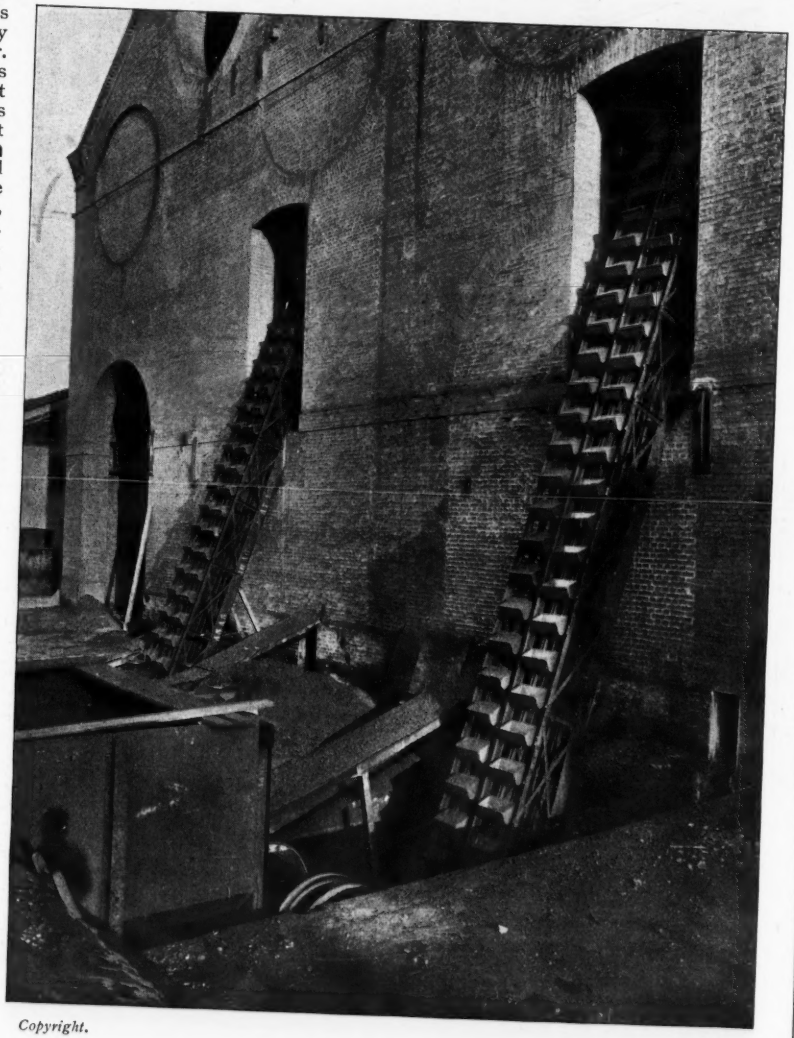
A Top View from Drawing-Stage Side of House—Showing the Long Coal Bunkers and Conveyors.



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The Twin Coal-Elevators.

the hydraulic main and fittings. The tar arrangements are also on the Edinburgh plan. The ascension and bridge pipes are 7 inches in diameter. The hydraulic main has a flat floor; and the dip-pipes descend to within 3 inches of the bottom. The outlet of the hydraulic main valve is arranged with a weir, under which the tar flows and the gas over the top. The hydraulic mains are tested every day for the presence of thick tar and pitch; and, on an accumulation occurring, the mains are immediately flushed, for which complete provision is made. The whole of the tar from the hydraulic mains passes through the hydraulic valve into the foul main; there being a separate tar connection for each bed. The foul main is 20 inches in diameter, and is built up of 3 in. by 3 in. by $\frac{1}{2}$ in. angle-iron and $\frac{3}{16}$-in. steel sheets, with the necessary provision for clearing out. The tar flows to the end of each bench, and down a vertical pipe into the syphon pot. All the tar pipe-connections are 8 inches diameter.

Now as to the construction of the stage-floors. The charging-stage is composed of 12 in. by 6 in. main cross girders, crossed by longitudinal girders 6 in. by 5 in., and covered by wrought-iron chequer plates. Down the centre perforated plates are fixed for ventilation purposes. The drawing-stages are made up of wrought-iron I steel joists, 12 in. by 6 in., with longitudinal girders for carrying the floor made up of 6 in. by 5 in. joists. The whole is filled in with concrete arches, set in cement, and covered with earthenware tiles, in order to keep the floor as cool as possible. The drawing-stages are supported on one side from the benches, and on the other by the walls of the houses. The charging-stage for each bench is 18 feet wide; the drawing-stages 20 ft. 9 in.; and, with the bench 17 feet wide, we have the 55 feet width of each house. The usual stairways are provided at the ends and centre of the benches.

The coal-handling plant is in duplicate for each bench; and each set is capable of dealing with 20 tons of coal or cannel per hour. In other words, the two sets to each bench have a combined capacity of 40 tons. The coal is brought in by railway waggons, and dumped into a 12-feet square wrought-iron hopper of the breeches type. Underneath the hopper there is a jigging-screen, for the purpose of screening the coal, and also for feeding it continuously and regularly into the breakers. There is a coal-breaker of the ordinary jaw type under each leg of the hopper; and these are capable of breaking 20 tons of boghead per hour. (Parenthetically, it may be stated that the coal used is Durham, and by the time it reaches Milan, there is little need of crushers.) By means of a connecting shoot of the usual double breeches type, arranged with a flap door, the coal may be taken from either of the breakers, and fed into either or both of the elevators. As will be seen by one of the photographs, there are two 18-inch lattice-braced bucket elevators, having 74 feet centres, and built side by side in the form of a twin elevator. A wrought-iron breeches shoot has been provided at the head of the elevators, and this is arranged to lead the coal from either or both of the elevators, and discharge it into either or both of the conveyors. The conveyors are 18 inches wide, of the push-plate type, and each 206 feet long centre to centre. The conveyors are supported on the tops of the coal storage tanks, and are provided with 32 outlet slides and doors so as to discharge the coal into the latter. Wrought-iron ladders and gangways are arranged for giving access to all this plant, which is driven by two powerful Crossley gas-engines. The coal-hoppers are in two lines of the continuous type, each line storing and supplying the coal required for eight beds of retorts. Each hopper is 96 feet long, by 8 ft. by 8 ft., and is capable of storing 24 hours' requirement of coal. Along the top outside edge of the hopper running the full range of the sixteen beds is an inspecting platform, 2 ft. 6 in wide. In the bottom of each 12-feet bay of the hopper there are three openings for the measuring chambers. To each bench of sixteen beds are fixed 48 measuring chambers of Graham's improved pattern, with his improved sure-feed apparatus. Each eight beds are furnished with a set of three charging-shoots of the same design as has been adopted at Edinburgh (Herring and Graham's patent), with a movable shoot on the bottom, which can be adjusted from 30° to 60°. For the second bench of sixteen settings, the coal handling and feeding plant as here described is in every respect similar.

Descending now to one of the drawing-stages, it is noticed that suspended from a light rail running in front of the benches are shoots (which are patented) for diverting the hot coke down the shoots formed in the stage at each side of the buckstays, on to the hot-coke conveyor situated below. The arrangement is a simple one; and in its very simplicity lies its value. It is illustrated in two of the photographs of one of the drawing-stages as completed. In connection with the hot-coke conveyor, a deviation from the usual practice is noted. The troughs are not suspended from the stage as is ordinarily the case, but are situated in the ground in the basement. There are two reasons for this—first, to secure uniformity, owing to the inclined settings previously installed having outside producers, which made the introduction of any coke plant difficult; and, secondly, in order that the drawing-stage might be left as cool as possible during the great heat of summer. It should not be forgotten that the variations of temperature in this part of Italy are extreme. Last summer over 90° in the shade was registered; and during the present winter, there has been 4 inches of snow, and far colder weather continously than in this country.

The coke plant installed at the works is on an extensive scale; but we must reserve the interesting details connected with it for a future article.

The photographs that are given this week not only illustrate the character of the work, but the dates on which they were taken testify to the rapid progress with which the construction of this large plant was accomplished by the Contractors.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List see p. 111.)

THE rosy expectations formed for the New Year on the Stock Exchange are already beginning to change colour. The rise in prices so enthusiastically wrought was too much of the mushroom growth, and not the sound and solid product of natural forces. Perhaps the rise was a little too much for the public; for they have not stepped in as they were wanted to. So the tendency last week was decidedly dull, except for some of the gilt-edged class, which were wanted for investment, and the American Market. In the Money Market, the opening rates were easy; but a hardening process rapidly succeeded, and ruled very firm to the close. In the Gas Market, business was only moderate, and about as good on any one day as another; but the tendency was decidedly favourable. There were no violent bounds upwards, but a good many small or moderate advances well distributed through the list of undertakings, which give better assurance of deliberate action and prospect of stability. The only downward movement was a casual drop in a Provincial Exchange, where a low price was given for an odd lot offered. In Gaslight issues, there was a fair amount of dealing in the ordinary, which, after changing hands at 85$\frac{1}{2}$ on the opening day, ran up to 88 on Thursday. But this, again, was too "mushroomy;" and it brought about a reaction to 86$\frac{1}{2}$. From this point, however, it steadied a bit; and the closing mark was 87$\frac{1}{2}$. The secured issues were only quiet; but they were in very good favour generally, and the maximum and the debenture gained a point each. South Metropolitan continued along the path of progress; and, improving almost daily, it gained a couple of points, and more than once changed hands at 123. The Suburban and Provincial group were very quiet, and exhibited no change except the retrograde move referred to above. More quotations are removed from the list pending the conversion of the shares into stock. Business in the Continental Companies was of the most limited proportions. Union continued weak; but European and Imperial were stonger, and each made a small advance in quotation. Among the undertakings in the remoter world, Bombay and Cape Town improved upon their last quotations. There is nothing of interest to report in connection with the Water Companies. Business was at about its ordinary rate of stroke, and only two issues made any change. But both were in the upward direction.

The daily operations were: Gas opened on Monday very steady, and was moderately active without any change in prices. In Water, Southwark rose 1. Tuesday's volume of transactions was lighter; but prices were on the rise. Gaslight ordinary improved 1, and Cape Town $\frac{1}{2}$. East London Water rose 2$\frac{1}{2}$. A little increase of activity was apparent on Wednesday, with further advances. Gaslight ordinary, ditto maximum, South Metropolitan, and Imperial rose 1 each. Thursday was quieter, but generally strong, though Gaslight ordinary was put back 1. South Metropolitan debenture rose 1, European new $\frac{1}{2}$, and both Bombays $\frac{1}{4}$. Friday was more active and cheerful again. Gaslight debenture rose 1. Saturday was firm. South Metropolitan rose 1 more.

"The Choice of Gas-Fires."—In response to inquiries, we have had prepared in leaflet form a reprint of Mr. Thomas Fletcher's interesting article on "The Choice of Gas-Fires," which appeared in the "JOURNAL" for the 23rd ult. These are now on sale, price 3s. per hundred; special quotations for quantities.

Strache Water-Gas Works for Barcelona.—We learn from M. Léon Defer, the Manager of the Company formed in Vienna for exploiting the Strache water-gas system, that the Barcelona Municipality have accepted the tender of the Company for the establishment of works of about 2$\frac{1}{4}$ million cubic feet daily capacity to start with; the length of mains being close upon 218 miles. The works will be under the control of the Municipality.

Estimating the Acidity of Gases from Vitriol Chambers.—At the December meeting of the London Section of the Society of Chemical Industry, an elaborate paper on the "Examination of Methods Employed in Estimating the Total Acidity of Gases Escaping from the Chamber Process for the Manufacture of Sulphuric Acid, with Suggestions arising from the Study of the Interaction of Nitrous and Sulphurous Acids, or their Salts, in Aqueous Solution," prepared by Mr. R. Forbes Carpenter, F.I.C. (the Chief Inspector under the Alkali Works Regulation Acts), and Mr. E. Linder, B.Sc., was presented. The text of the paper, which will be found in the last number of the Society's "Journal," bears evidence of a thorough investigation of the subject; and in the course of a few remarks by Dr. Messel, he testified to the extreme accuracy and utility of the work the authors had carried out, with which he said he had been acquainted from its inception.

THE GRANTON WORKS OF THE EDINBURGH AND LEITH GAS COMMISSIONERS.

DESCRIPTION PREPARED

BY

WALTER RALPH HERRING, M.INST.C.E., *Engineer.* *

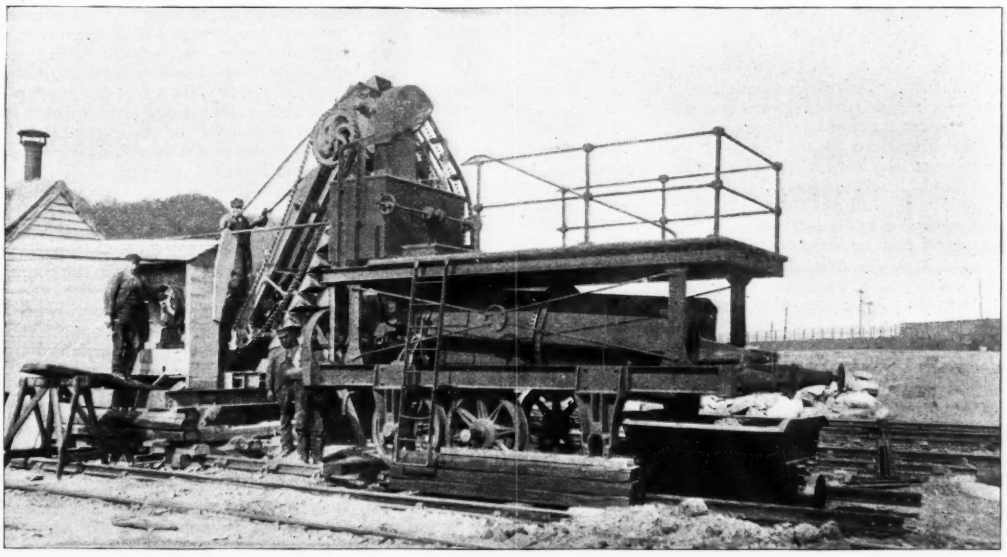
ARTICLE II.

The possibility of obtaining suitable foundations at moderate cost was an important factor when investigating the relative values of the respective sites under consideration. As a matter of fact, the choice fell upon two in particular, both of which, as far as they could at the moment be investigated, offering good facilities in this respect.

Probably no other industrial undertaking requires a more stable foundation than a gas-works. The heavy structures and apparatus impose a greater weight on a given area than is usually to be found in manufacturing concerns. There is also the fact that, in almost every case, it is of the utmost importance that the foundations should remain absolutely level, in consequence of so much of the apparatus, and so many of the different devices employed, depending upon comparatively delicate water-seals. The uniform level of the communicating arteries is also an essential; only a slight settlement being sufficient to completely disorganize the working of some of the plant.

For this reason, therefore, the question of a stable foundation is of supreme importance; and the expenditure to secure one is of very considerable moment. Yet, strange to say, this is one that is often neglected when purchasing a gas-works site. As often as not the substratum is an altogether unknown quantity; the site alone being purchased for its locality and general superficial lie, and not infrequently because it is cheap. The ease with which £300 or £400 per acre of land bought can be spent in securing a stable foundation should, however, be a ready argument to urge against the purchase of cheap land, irrespective of its suitability for such purposes. The question of the level of the site in relation to the area of supply is now of much less importance (compared with its suitability for constructional purposes) than was formerly the case, owing to our present efficient manner of propelling gas to the sources of distribution.

The area of Granton works may, generally speaking, be defined as having been a good one for securing stable foundations. In saying this, however, it must be admitted that its characteristics were found to be of a most complex and varying character—the most extraordinary divergences in the character of the substratum being discovered in close proximity one to the other. Reliance could not be placed upon the character of the subsoil at points as close together as 20 feet; a completely different character exhibiting itself at times within so close a range. In one particular instance—when sinking the foundations for the main piers of the retort-house, at the fifth pier from the south end on the east side of the retort-house, at 8 ft. 6 in. below the original ground line—running sand was encountered, notwithstanding the fact that on either side of this excavation, only 16 feet away, a stable foundation was found at about 3 feet below the normal surface. It was found impossible to excavate the running sand without endangering the foundations on either side. So it was determined to pile this particular place, which was done to an average depth of 9 feet below the 8 ft. 6 in. level mentioned.



PHOTOGRAPH No. 5.—Stone crusher and concrete-mixing machine, showing the elevators for the broken stone and sand and the narrow-gauge railway waggon receiving mixed concrete. (May 14, 1900.)

The site of the works has evidently suffered severely from glacial action in earlier times; a large area having the nature of a conglomerate. There are beds of sand and gravel in some places, and large boulders of stone of a different characteristic to the local stone, as well as huge granite boulders which must have travelled a distance of 60 or 70 miles.

Needless to say, such a site was of very considerable interest to the Engineer—demanding, as it did, the determination of foundations for every piece of work from actual observation and consideration upon the site. In all cases, therefore, without exception, every superficial foot of foundation was determined by a careful examination of the excavated levels when these had been carried to the minimum depths necessary for the various parts of the structure involved.† The cross-sections of some of these will be illustrated upon the drawings relative to the buildings to which they apply, and will afford a very interesting consideration—in variety, sufficient to please the most exacting taste in this respect.

Portland cement concrete has formed the substance of all the foundations throughout the works; the ballast used being obtained from the gas-works retort and brick refuse, the surplus rock from the gasholder tank excavations, as well as the smaller stone from the Commissioners' own quarry on the site.

At the outset, a large type of Blake's stone-breaker was erected in such a position as to be easily fed with stone by discharging the waggons conveying the ballast to the works direct into the hopper. The breaker was fitted with an elevator, arranged to discharge either into the ballast waggons on an adjoining line of railway when dry ballasting was required for railway and other purposes, or into the measuring hoppers in connection with the special type of concrete-mixing machine which had been designed for the occasion.

Photograph No. 5 gives a general idea of this apparatus; but it may be further described in the following terms: The machine is supported upon a frame fitted with wheels and axles suitable for running on the permanent railways; and it has for a mixing drum a deeply grooved corrugated cylinder, the corrugations lying longitudinally—the cylinder being suspended upon trunions and revolving, having a slight inclination towards the discharging end. Superimposed above the cylinder a platform is erected, at one end of which a ballast-hopper is constructed, divided in the centre; each half having a capacity of 1 cubic yard. Immediately in front of these hoppers, and raised slightly above the platform level, smaller hoppers for cement are provided with

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† In regard to this matter, Mr. Herring writes: "On p. 26, the beginning of the third paragraph from the bottom of the right-hand column should read: From a point E, with the depth varying between 5 and 6 feet to 22 and 23 *feet* below the natural surface—not *inches* as was inadvertently allowed to pass in the last corrected proof."

PHOTOGRAPH No. 6.—Retort-house No. 1, foundations on east side, showing the brick-encased concrete piers with skewbacks for the intervening concrete arches. (July 7, 1899.)

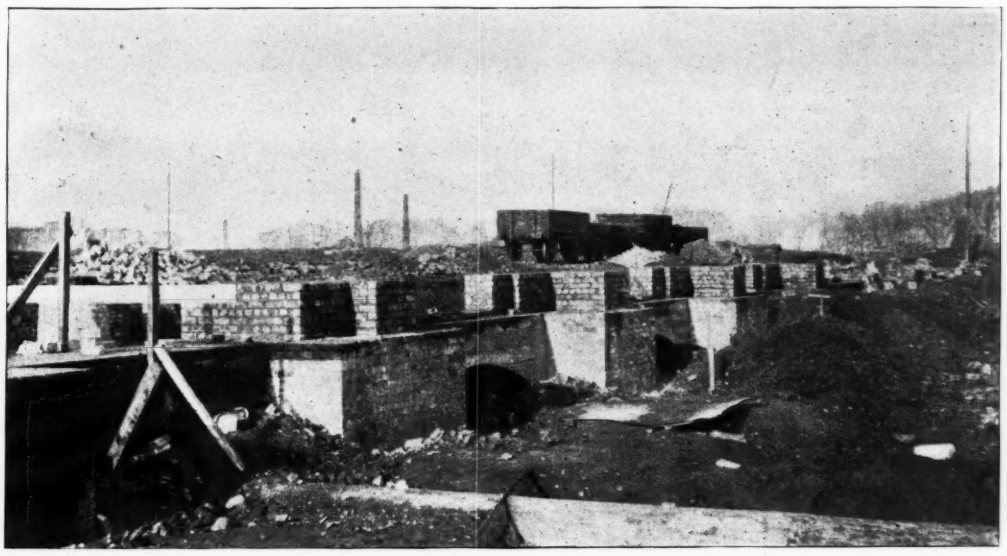
gauge-bars fitted therein, so as to enable varying proportions of cement to be used for different qualities of concrete.

The elevator from the stone-breaker has a swivel spout at the upper end, and is made to discharge into either one or other of the ballast-hoppers. There is an opening at the base of the ballast-hopper which is regulated by means of a hand-wheel so as to permit of the contents of the hopper discharging from the base and feeding direct into the mixing drum—the one operation releasing the valve at the base of the cement-hopper as well, so that as soon as the ballast-hopper is filled as well as the cement-hopper with their regulated quantities, the operator releases the bottom valves, and the contents fall into the mixing cylinder beneath. The deep corrugations in the mixing cylinder, which is made to revolve at some seven to twelve revolutions per minute, have the effect of completely mixing the ballast and cement—at the same time gently throwing it forward towards the outlet of the machine. The mixing cylinder is 10 ft. 4 in. long, and the carriage 19 ft. 6 in. long over the buffers.

About the middle of the cylinder a water spray is fitted; the quantity of water being regulated by the man attending to the loading of the concrete waggons. The concrete is then automatically and continuously thrown forward (owing to the slight inclination of the drum) to the discharging end of the cylinder, where it is received in water-tight tipping-waggons, of 2 cubic yards capacity, running on a narrow-gauge railway upon which it is transported by horse haulage to any part of the works where concrete is required for foundation or other purposes.

On one side of the machine there is a small sand elevator, with a boot near the rail level, for the purpose of elevating sand should any be required for mixing with the ballast. Experience at Edinburgh, however, proves that, with ordinary stone or brick ballasting, a sufficient proportion of small is produced in the stone-breaker to fill the whole of the voids in the composite mass. The platform above the mixing chamber of the machine is used for the storage of cement; the cement waggon being discharged immediately alongside on to the platform from an adjoining line of rails, and the cement covered with a tarpaulin to protect it from inclement weather. The stone-breaker, together with the

PHOTOGRAPH No. 8.—Shows the piers under the division walls of the retort-settings, consisting of brick-encased concrete filled in between with selected earth. (Dec. 11, 1899.)

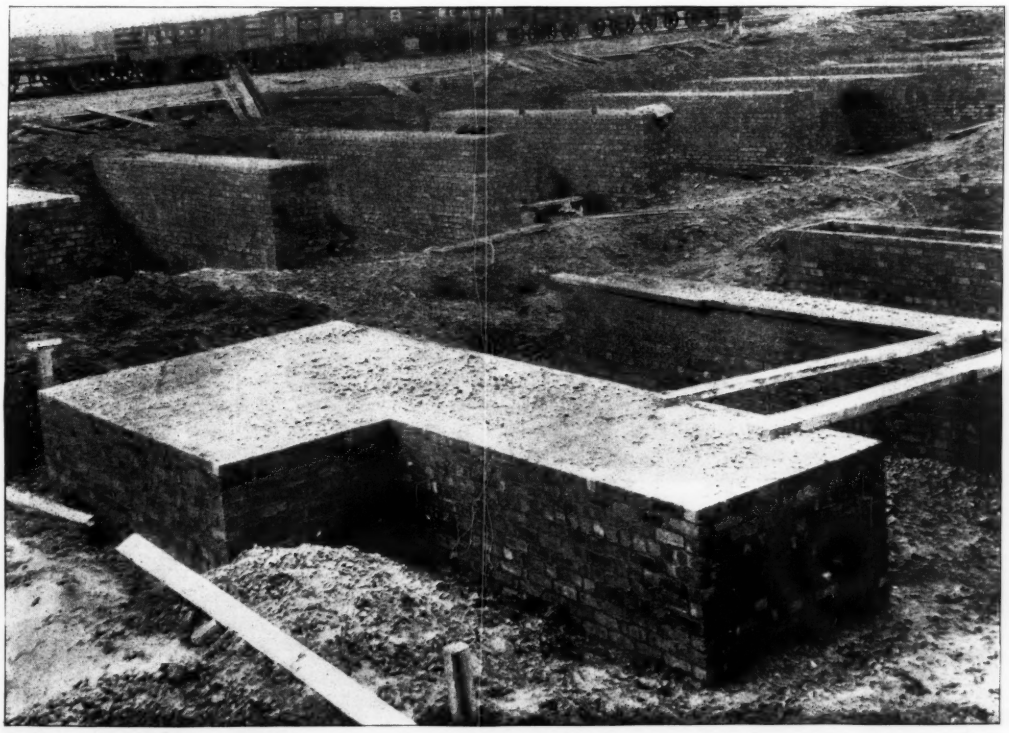


PHOTOGRAPH No. 7.—The brickwork upon the concrete foundations of the retort-house, west side, showing the internal piers for supporting the main roof girders. The upper surface of the brickwork shown is the present floor-level. (Oct. 31, 1899.)

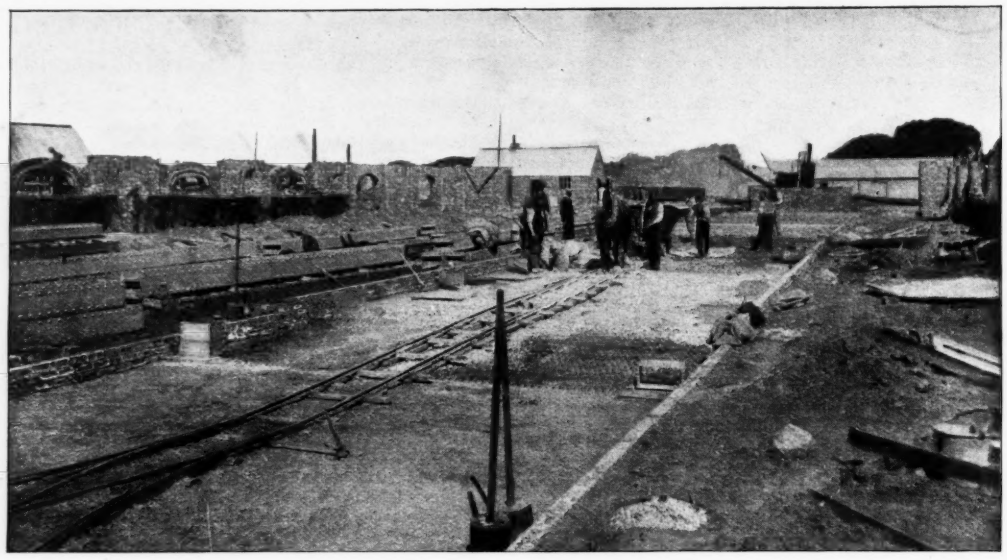
elevator, is driven by a strap worked from the portable engine in the adjoining shed. The concrete-mixing machine, however, is driven by a small double-cylinder engine encased in a dust-proof box on the end frame, immediately beneath the mixing-hoppers—driving by means of gearing the mixing chamber, together with the sand elevator direct.

In designing this machine the mixing drum of Messrs. George Waller and Co.'s hand-power concrete mixer was adopted, but applied to the very much larger and newer purpose. It may be interesting to remark that (approximately) 8288 cubic yards of concrete have been turned out by this machine in connection with the works; and that the costs of preparing, making, and laying the same have been as follows for various purposes. When in full operation and with a continuous supply of ballast in waggons, the outlay for concrete (7 to 1), including the materials, was as shown during the summer months.

	Per Cubic Yard.
Quarrying stone and raising to surface	2s. 0d.
Loading stone into waggons, transporting and shunting to crusher	6½
Feeding crusher and elevating and attending engine	3½
Delivering cement to machine from store	0¾
Attending cement mixer, mixing and discharging into tipping waggons	3½
Laying light railway	1¼
Hauling by horse on light railway	2½
Tipping concrete, spreading, levelling, and ramming in foundations	7¾
Cost of cement (at 32s. 6d. per ton)	4 10½
Fuel, oil, waste, &c.	1¼
Total cost for materials and labour per cubic yard of 7 to 1 concrete laid in position	9s. 1¼d.



PHOTOGRAPH No. 9.—Shows the piers under the division walls of the retort-bench, consisting of brick-encased concrete, particularly the end pier with the foundation for the chimney. (Jan. 4, 1900.)



PHOTOGRAPH No. 10.—Showing the method of laying the expanded-metal concrete upon the foundation piers for the retort bench. (July 7, 1900.)

During the winter period, and during periods of intermittent use, the maximum costs were as under:—

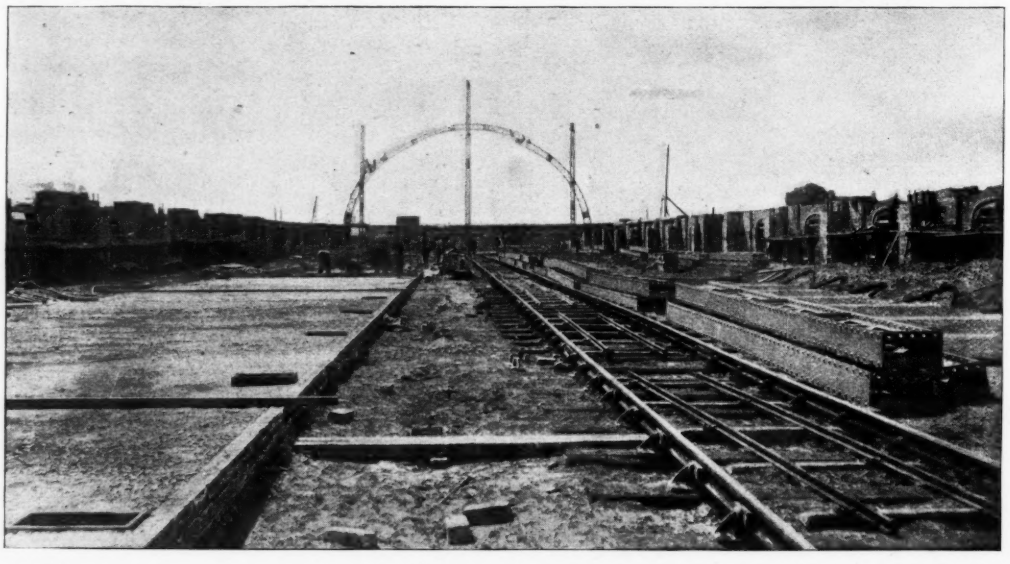
	Per Cubic Yard.
In carrying stone and raising to surface	2 0d.
Loading stone into waggons, transporting, and shunting to crusher	6½
Feeding crusher, elevating, and attending engine	6¾
Delivering cement to machine from store	1¾
Attending cement mixer, mixing, and discharging into tipping waggons	5½
Laying light railway	2¼
Hauling by horse on light railway	4¾
Tipping concrete, spreading, levelling, and ramming for work, such as floors, yard, &c.	1 1½
Cost of cement (at 32s. 6d. per ton)	4 10½
Fuel, oil, and waste	1½
Total cost for materials and labour per cubic yard of 7 to 1 concrete laid in position	10s. 4d.

It may be interesting to state that the stone-crushing machine turned out approximately 5 cubic yards of broken stone or brick per hour; and this was almost the full capacity of the crusher with two men feeding it continuously. With a duplicate crusher, almost double this quantity could have been made in the same time, as the engine power and elevating machinery were not worked up to the full capacity.

To give an idea of the advantages and economy derived from the preparation, mixing, and laying of concrete by using the machines described as compared with hand labour, it may be mentioned that the contractor's price for 6 to 1 concrete, 12 inches thick in the foundation of the walls of the gasholder tank was 14s. 6d. per cubic yard—the stone or aggregate being supplied by the Gas Commissioners in an unbroken state; and the contractor's price for concrete (6 to 1) 18 inches deep, in the foundations of the products' works buildings was 15s. 6d. per cubic yard, where the aggregate was supplied unbroken by the Gas Commissioners. Further, the contractor's price for the labour only for breaking, gauging, mixing, wheeling, tipping, spreading, levelling, and ramming the concrete (6 to 1) in the foundations of the retort-house and coal-store buildings was 3s. 10d. per cubic yard, as compared with the maximum costs of 1s. 8½d. with the machines.

The portland cement used in connection with the works, both for concrete purposes and for general building purposes (cement mortar being used in all cases) has been mostly of Continental manufacture; the bulk of it having come from near Denmark, as well as a large quantity from near Hamburg. This cement, when offered in the first instance, was considerably cheaper than an equal quality offered by British manufacturers; and it was found throughout, from the systematic testing employed, that it was to be absolutely relied upon for uniformity of grinding and tensile strength. Its very finely ground properties permitted of a larger proportion of either sand or ballast being employed than was the case with the average standard of grinding in England four years ago, coupled with which it is as well at this stage to remark upon the very clean character of the ballast employed. Too much emphasis cannot be placed upon the necessity of the ballast being absolutely free from loam or earthy matter, or soft substances of any kind, and next in importance is clean water for the operation of mixing.

The inequalities of the level of the site, as will be seen from



PHOTOGRAPH No. 11.—Showing the completed foundations for the retort-bench, with the pockets for the buckstays provided herein. (July 7, 1900.)

photographs already published, in particular under the section of the work that has now been completed—have embodied a greater outlay in foundation construction than any of the future sections are expected to do. The manner in which the various circumstances have been met will be illustrated in some cases on the drawings in relation to the buildings, and perhaps more particularly by reference to the photographic reproductions accompanying this article.

In theory, the buildings are a series of piers of brickwork with an intervening panel to protect the interiors from atmospheric conditions. Take, for instance, the retort-house. It is covered by a curved girder roof springing from a point 10 ft. 6 in. above the yard-level. This necessitated a pier or buttress for its support. The floor-joints which at the same time act as struts to the front buckstays of the retort-benches also abut on this pier. Its construction had, therefore, to be of such a character as to withstand both the weight and the thrust likely to come upon it. These main piers are 24 feet centre to centre longitudinally, and are supported upon concrete piers sunk beneath the ground surface to a point where a satisfactory base was considered to have been arrived at. These concrete piers are 8 feet square; and below the natural ground-line they were sunk in a clean-cut excavation. Immediately before the first layer of concrete was put in, the sides of the excavation were undercut so as to extend the base of the concrete pier by forming a footing 12 inches all round—thus giving at the base an area of 100 superficial feet; the pier itself being 64 superficial feet in area.

Above the natural ground-line to a point 2 feet below the retort-house clinkering-floor level, which in some cases was as much as 7 or 8 feet in depth, and where nothing existed for supporting the concrete to form the pier, a system of brick-encased concrete construction was introduced (see Photograph No. 6). This consisted of a 4½-inch brick wall built in cement mortar four or five courses deep, forming the outside of the pier; and after this had been allowed to become set, the interior was filled in with plastic cement concrete—every fifth course of brickwork being a heading-course to act as a tie. This brick-encased concrete construction was found to be much more economical than the construction of wooden frames for containing the concrete. It was also much easier to line-off and keep the work true and square; a rough class of brick being quite sufficient for such a purpose below ground. Subsequently, this method of concrete construction, both above and below ground, was carried out to a very large extent, as will be subsequently referred to.

The intervening space between the main piers, where the shell of the walls of the buildings required supporting, was given its support by the construction of a concrete arch from pier to pier, where a reasonable foundation for the walls could not be obtained at the minimum depth. The same system of foundation construction was carried out in connection with the coal-store buildings; the piers in this case being also 24 feet apart, and the intervening space bridged with a concrete arch. This building, being of a lighter construction, the foundation work was proportionately reduced.

Photograph No. 6 illustrates the construction of these piers on the west side of the retort-house, with the formation for the construction of the skewbacks for the arches in process. The general yard-level is seen in the distance, where the railway-sidings have been laid upon the surplus excavation from the tank which was used for filling up.

Photograph No. 7 shows the foundations with the first 2 feet of brickwork built thereon; this being the damp-proof line and also the present retort-house floor-level. The same photograph also shows the culvert after construction and when nearly filled in.

The foundations of the retort bench—see Photographs Nos. 8 and 9—are perhaps worthy of special attention being called thereto; the variations of the levels being very considerable. It will be seen that 9 to 10 feet in some places had to be filled in to bring the level up to that of the retort-house. After due consideration, it was determined that the foundations of the retort-benches should be constructed in a similar manner to what had been done with regard to the buildings—namely, constructed upon piers brought up from the solid. The division walls of the retort-benches are 12 feet centre to centre, and are 2 feet thick above the ground-line.

Trenches were, therefore, cut 2 ft. 9 in. wide beneath the natural surface of the ground to a sound bottom; and before the concrete was placed therein, the sides of the trenches were undercut to 4 ft. 3 in. wide, or 9 inches on each side. The trenches were then filled with concrete to the natural surface-level; these trenches being 12 feet centre to centre and 21 ft. 2 in. long. From this point, the brick-encased concrete construction was continued to a point 18 inches below the present retort-house level; the piers being brought up 2 ft. 9 in. wide by 21 ft. 2 in. long over the brickwork casement. Photograph No. 8 shows some of the piers flush with the concrete. There being four complete benches in the retort-house, each bench of fourteen settings is supplied with two dwarf chimneys. The chimney foundations form part of the end walls of each bench, and are seen on both Photograph No. 8 and (particularly) on No. 9.

The intervening spaces between these division walls, measuring 9 ft. 3 in. wide by 21 ft. 2 in. long, were filled in with selected earth—mostly of a sandy or loamy character, and well pounded and brought up to the level of the tops of the division walls.

The season during which these foundation works were in course of construction was a very wet one. Advantage was taken of this circumstance to allow the filling in between the foundation walls for the retort-bench to stand for some considerable time, prior to putting the bed of concrete across the top; any settlement that did take place in the meantime being duly filled in and levelled up with selected earth. In fact, while the supporting walls for the retort-bench foundations were in progress in the autumn of 1899, a commencement was not made with the laying of the concrete bed until the spring of 1900.

A careful calculation was made as to the probable weight that would require to be supported by the retort-bench foundations. The division walls, as already stated, were 12 feet centre to centre and 2 ft. 9 in. in width; leaving an intervening space of 21 ft. 2 in. by 9 ft. 3 in., which was filled in with surplus earth. Resting upon these walls, a bed of concrete extending slightly more than the full length of the bench, and in breadth 21 ft. 2 in. (the neat brickwork of the bench being 17 ft. 2 in. in breadth) was to be laid; and it was found that, by inserting expanded metal mesh, 18 inches of concrete would be ample to carry the superincumbent weight of the retort-settings.

Expanded metal is now comparatively well known among engineers, but it may not be out of place to add a few explanatory details. It is formed by expanding "solid flat sheets or plates of various thicknesses and metals into lattice or mesh-work." Its cost is comparatively small, when its advantages are taken account of, as well as its simplicity and absolute reliability—affording as it does that transverse and diagonal bond to concrete works under tensile stress, that is a very important factor in engineering structures. In brief, expanded metal consists of sheets of metal mechanically slit or cut, and deployed or opened out, in such a manner as to produce trellis or net-like work of diamond-shaped meshes, with strands of varying sizes and thicknesses. It will be understood that this process produces a fabric of from two to twelve times the covering area of that of the original sheet, according to the size of the diamond-shaped meshes and depths of strands. A sheet of the expanded metal may be cut to any size required without reducing its aggregate strength materially for a given area. From numerous experiments, it has been ascertained that the insertion of this thin sheet of open-work metal in a slab of concrete, increases the carrying power of the concrete fully tenfold. The sheets can be procured up to 20 feet long by 8 feet wide, and for greater width the sheets are over-lapped on the mesh and clipped together. This was done in the instance under review; the metal being laid from pier to pier the long-way of the mesh. The expanded metal used was made of very mild steel, having an ultimate resistance of about 22 tons per square inch, with 21 per cent. elongation in 8 inches. The sheets were of No. 10A pattern, having meshes 3 inches wide and 8 inches long; and the substance of the strands gauging $\frac{3}{8}$ inch by $\frac{3}{16}$ inch. It was estimated that the 12 inches of concrete with the metal embedded in it could carry a safe load of 8 cwt. per foot super, at the clear span between the walls; the space being filled in with earth and rammed solid. The sheets were laid down immediately upon the filled-up ground with the ends resting upon the division walls on either side, and carefully overlapped and bonded on the sides. The concrete mixture was then brought forward in the tipping-waggons on the light railway and emptied out, spread over the surface and thoroughly tamped down—the metal being eased up with shovels to ensure the concrete getting underneath and all round about and through it. This process results in the metal becoming embedded in the lower part of the slab, thereby obtaining its greatest efficiency for the purpose under review, and the whole constituting an efficient binder. The concrete was laid in two layers, each 9 inches thick; the proportions being seven parts of broken stone or brick to one part of portland cement—the whole being broken and mixed through the stone crusher and concrete mixing machine.

Photograph No. 10 illustrates, in a pretty clear manner, the formation of the construction of this foundation. The light railway shown is the railway communicating with the concrete mixing machine, from which the horse had brought the 2-cubic yard tipping-waggons of mixed concrete ready for laying in position. On either side of the space cleared for the bed of concrete the wooden frames forming the pockets will be seen for receiving the feet of the front and back buckstays of the bench. A cast-iron plate was provided, resting upon the lower division walls; and upon this the wooden frame was fixed in position just exactly where the buckstays were to be placed on the finished bench. The small substance of concrete between the outer side of these casings and the outside of the bed of concrete would have been insufficient to prevent the feet of the buckstays kicking outwards with the outward thrust of the bench. To prevent this, therefore, bent steel 6 inch by ¾ inch straps were inserted, with their ends turned and embedded in the concrete. Some of these straps can be seen in Photographs No. 17 and No. 18; the latter showing one side of the foundation finished, and the other in course of construction.

Upon the completion of the bed of concrete, and when the retort-bench had been built, these wooden frames were cut out the buckstays placed in position; and steel wedges driven in between the steel straps and the back flange of the H steel buckstay. The same method was adopted for securing the end buckstays—stronger straps being employed. It may perhaps be incidentally remarked that this method of securing a buckstay has proved thoroughly satisfactory.

GAS BILLS FOR 1903.

LAST week we dealt with the Bills proposing to incorporate Gas Companies; the following are for conferring further powers upon Statutory Companies.

The Bournemouth Gas and Water Bill is promoted by the Company to enable them to take additional lands, at Poole, for the extension of their works, part of which belongs to the Corporation of Poole, and may be taken on long lease instead of being purchased outright. Certain foreshore works may be constructed for the Company by the Poole Harbour Commissioners and the Corporation, to be completed within five years. The Company will have power to construct and maintain gantries over the new quay. The capital powers of the Company are to be increased by £100,000.

The British Gaslight Company Limited (Norwich) Bill is to authorize the Company to expend £200,000 upon their Norwich undertaking, in addition to £285,000 already expended, on condition that not more than £150,000 of this additional sum is capital stock of the Company, bearing 5 per cent. dividend, and £50,000 is loan capital at 4 per cent. More gas lands are required. The limit of central management expenses chargeable to Norwich is to be increased to £1200 per annum.

The Broadstairs Gas Bill proposes the compulsory acquisition of new gas lands, and the increase of the Company's capital by £60,000 in 7 per cent. ordinary stock. Not more than £20,000 of this capital is to be created as preference capital; and this is not to bear more than 4 per cent. dividend. Borrowing powers are to be in the proportion of one-third.

The Commercial Gas Bill has already been noticed in our columns. It is therefore only necessary, for the purposes of this record, to state that it is to provide for the testing of the Company's gas by Sugg's "London" argand burner so used that the gas in burning shall give a light equal to 16 candles; the chimney employed being that prescribed for 14-candle gas.

The Crystal Palace District Gas Bill has also been summarized. It is to enable the Company to take additional lands for the extension of their works at Lower Sydenham. The standard illuminating power of the gas is to be reduced to 13 candles as from Jan. 1, 1904, and the initial price from 3s. 2d., as fixed by the Act of 1893, to 3s. per 1000 cubic feet. The lower limit of the neutral zone of price is to be reduced to 2s. 9d. instead of 2s. 10d. as at present. Suitable burners for the new grade of gas are to be supplied gratis on application within twelve months to all other than slot meter consumers. The test burner is to be the "London" argand; and the gas is to be burnt at such a rate as to yield the maximum light for which the burner is designed. Only a single test is to be necessary; and the gas must have burnt for at least half-an-hour. The table photometer and the 10-candle pentane standard lamp are to be used. The name of the Company is to be changed to "The Sydenham Gas Company." Permission is desired to issue stock to consumers and employees of the Company at the average market price of the previous month. Provision is made for the appointment of Workmen Directors after the employees' investment in the stock exceeds £10,000 nominal. Arrangements are to be made for nominations to facilitate dispositions of stock by the employee proprietors.

The Derby Gas Bill is to consolidate the capital of the Company into an equivalent amount of 5 per cent. stock. Additional capital to the amount of £150,000 is required, with power to borrow one-fourth of the nominal amount of the consolidated stock, and one-third of the amount of the new issue. New stock may be issued to gas consumers and employees at the average market price of the previous three months. To ascertain this average price, the mean price recorded in the Company's books for the period is to be taken, or for twelve months if no sales have occurred in the shorter period. Stock is to be paid for within one month of sale. A renewal fund is to be formed out of revenue. The standard price of gas is to be 3s. 4d. per 1000 cubic feet. The quality of the gas is to be 14 candles, tested by the "London" argand burner, so used as to yield the maximum light for which it is designed, with the table photometer and the 10-candle pentane lamp. Provisions are made for the declaration of interim dividends, and the forfeiture under stated conditions of unclaimed dividends and stock. Additional lands are required. Consumers' fittings may be specified. Gas is to be supplied to public lamps within 25 yards of a main at the lowest price current, not being for a power consumption or under contract for supply in bulk. Consumers' discounts up to 25 per cent. may be allowed. No person other than a retiring Director or Auditor is to be eligible as a candidate for election to these offices who has not held the qualification for six months and given 10 days' notice of his candidature.

The Faversham Gas Bill is to convert and consolidate the existing capital of the Company into equivalent 5 per cent. stock, with the addition of £56,000 and one-third loan. The prescribed illuminating power of the Company's gas is to be reduced to 14 candles, and the initial price to 3s. 11d. within a radius of 2200 yards from the centre of the existing gas-works, and 4s. 5d. beyond. In making tests, the gas is to be burnt at such a rate as to yield the maximum light for which the burner is designed. Consumers' discounts up to 20 per cent. may be allowed. Additional gas lands are to be sanctioned.

The Gaslight and Coke Company's Bill has already been abstracted. It is to enable the Company to add to their debenture stock a further nominal amount of £1,000,000, to be known as "Second Three Per Cent. Debenture Stock" and to rank after the existing consolidated debenture stock as regards capital and interest. After Jan. 1, 1904, the standard price of gas is to be 3s. 6d. instead of 3s. 9d. for 1000 cubic feet, with the sliding-scale altered to 2s. 8d. for a penny up or down in the price of gas. Before distributing an increased dividend under the sliding scale, an amount of 8d. per cent. on the total of the ordinary stock is to be set aside to form a redemption fund; and thereafter the balance of 2s. (making the allowance of 2s. 8d. for a penny) may be distributed. And so on with every further increment. The "divisible profits" in this section means the whole amount of the Company's clear profits for the year, exclusive of any carry-forward. The redemption fund thus formed is to be used in the following year in purchasing ordinary stock, which is to be forthwith cancelled; the operation to cease when the Board of Trade has been satisfied that the Company's obsolete capital, referable to the closing of several stations, has been extinguished. The Company's reserve fund is not to be used for the purpose of distributing a higher dividend than 4 per cent. on the ordinary stock. Powers to hold certain lands are required, and an additional 150 acres is desired, not for manufacturing purposes.

The Gorleston and Southtown Gas Bill is to empower the Company to obtain and use additional gas lands, and to increase their capital by £54,000, with one-third loan. A renewal fund is to be formed by appropriating 1½ per cent. on the paid-up capital out of revenue, until the fund amounts to 5 per cent. on the capital, or £3950. Gas consumers' fittings may be specified. A saving clause is inserted for the protection of the Corporation of Great Yarmouth.

The Hampton Court Gas Bill is to authorize the Company to extend their works, and consolidate their existing capital into a uniform stock amounting to £126,600, with an addition of £100,000. Borrowing powers are asked for to the extent of £25,000 on the old capital, and one-third of the additional capital. The standard price of 3s. 9d. per 1000 cubic feet is proposed, for 14-candle gas tested by a standard burner yielding its maximum light. Consumers' fittings may be specified. Permission is sought to apply for an Electric Lighting Order.

The Harrow and Stanmore Gas Bill is to authorize the Company to acquire additional lands for the general purposes of their undertaking, within five years. More capital is required, to the amount of £100,000, to rank as "C" capital. The application of the profits is defined anew, the provision of the Act of 1894 being repealed. It is now proposed that the available profits shall be applied first in payment of the perpetual cumulative guaranteed dividend to which the guaranteed shares are entitled, and the arrears if any. The balance of such profits is to be devoted to the payment of the respective dividends to which the different classes of capital are entitled. Whenever the "C" capital takes over 6 per cent., the guaranteed shares are to be entitled to participate up to an additional 1 per cent. beyond their 6 per cent. guaranteed dividend. The loan capital is to be in the proportion of one-fourth. A clause proposes that one signature shall suffice for receipts of interest on debenture stock standing in one name. The rate of interest payable on consumers' deposits is reduced from 5 to 4 per cent.

The Hexham Gas Bill is to empower the Company to enlarge their works, and to increase their capital by £30,000. The old capital is to be consolidated. Provision is made for the forfeiture of unclaimed dividends and stock. The loan capital is to be in the proportion of one-third. The auction clauses are to extend and apply to debenture stock. The sliding-scale is required, with 3s. 9d. as the standard price within the urban district, and 4s. 9d. beyond. Consumers' discounts are not limited to any figure.

The Ipswich Gas Bill is to extend the general powers of the Company. The district of supply is to be widened to include a number of parishes. The capital of the Company is to have an addition of £150,000, with one-third loan. New issues may be offered at the reserve price to consumers or employees. Additional gas lands are required. Consumers may be allowed discounts to an unspecified percentage; and internal fittings may be specified.

The Maidstone Gas Bill is to convert and consolidate the Company's existing consolidated 7 per cent. stock into the equivalent amount of 5 per cent. stock, with £75,000 additional. New issues may be offered to consumers and employees at the market price. The loan capital is to be one-third of the capital stock actually raised. The illuminating power of the gas is to be reduced to 13 candles. Gratis burners are to be supplied. The standard price of gas is to be 3s. 6d. per 1000 cubic feet in the home district, and 4s. 3d. beyond. Consumers' fittings may be inspected. There is a saving clause for the protection of the Corporation.

The North Middlesex Gas Bill is to empower the Company to raise £120,000 of new capital, with one-third loan. Bids of consumers for new issues are to have priority over those of old shareholders. The standard price of gas is put at 4s. 3d. per 1000 cubic feet. A renewal fund may be formed by the appropriation of ½ per cent. on the paid-up capital, up to one-third of this amount.

The Plymouth and Stonehouse Gas Bill is to extend the limits of supply to include the parish of Plymstock, and enable the Company to raise £100,000 of new 5 per cent. capital. Unsold

new issues can be offered at the reserve price to employees or consumers. Loan capital is to be in the proportion of one-third. The initial price of gas is to be 3s. 6d. in the outdistricts. A 1 per cent. renewal fund is to be formed, amounting to 10 per cent. on the paid-up capital. Gas of 13-candle power is to be supplied. Additional gas lands are required.

The Scarborough Gas Bill is to enable the Company to raise £75,000 of additional capital carrying a 5 per cent. dividend, with one-third loan. Interim dividends may be declared; and dividends unclaimed for six years may be forfeited for the benefit of the Company. A special clause vacates the office of Auditor, and provides for its tenure by a Professional Accountant.

The Sittingbourne District Gas Bill authorizes the raising of £50,000 of additional capital, with one-fourth loan. A 1 per cent. renewal fund is required, up to 10 per cent. of the paid-up capital. Further gas lands are to be sanctioned. Contractors with the Company are not to be disqualified from holding the office of Director. Consumers' fittings may be specified. Consumers' discounts up to 10 per cent. may be allowed.

The Walker and Wallsend Union Gas Company (Additional Powers) Bill is to empower the Company to enlarge and extend their existing gas-works at Walker, and to increase their capital by £150,000. The present capital is in the form of 7 per cent. consolidated stock, which is to be converted into 3½ per cent. stock, without affecting the amount of the insurance fund. Unsold stock may be offered to employees or consumers. Borrowing powers are to be in the proportion of one-third. The standard price of gas is put at 3s. 3d. per 1000 cubic feet, with an increase of dividend (nothing is said of decrease) of 2s. 6d. per cent. for a penny reduction. A 1 per cent. renewal fund is desired, amounting to 10 per cent. on the capital. The existing gas-works sites, held on lease from the Corporation of Newcastle-upon-Tyne, are to be purchased. A railway connection is to be made into the works. The illuminating power of the gas is to be reduced from 15½ to 14 candles, tested by a burner yielding its maximum light. Consumers' fittings may be specified. Discounts up to 25 per cent. are to be allowed.

The Winchester Water and Gas Bill is to convert the existing share capital of the Company into 5 per cent. stock, with the addition of £75,000, and one-third loan. The gas limits are to be extended. New gas lands are required outside the city.

ELECTRIC LIGHTING MEMORANDA.

The Fulham Fatalities—The "Electrician" Explanations—Views of the Public—The Case of the Kingston-on-Thames Undertaking.

For very good and ample reasons the Fulham Baths fatality has been elevated to the eminence of a question of the day, and of the future, in electric lighting circles. And these circles are very wide indeed. Having their common centre in the industry and enterprise of public electricity supply from central stations, they embrace in their sweep a great diversity of considerations too important and numerous for mention here. It is evident, however, on the face of the facts, that unless the bad impression left on the public mind by the Fulham Baths incident is speedily removed, the cause of electric lighting, and incidentally the reputation of municipal trading in electricity, will lose heavily in popular esteem. When we discussed the most salient features of the affair last week, and drew what appeared to our judgment to be the most impressive "moral" from the story, we had not the advantage of being in possession of the views of the electrical journals on the facts of the case. Now these valuable opinions are public property; and it is only fair that they should be summarized here, so that if they are competent to do so, they may have their due effect in counteracting whatever is unfavourable to electric lighting itself in our necessarily spontaneous reflections on the accident. Nothing could be more candid than the admissions of the "Electrician" as to the gravity of the affair. It is frankly confessed that the occurrence has "aroused a universal feeling of uneasiness," and that it "may tend to create a certain feeling of distrust in the minds of electricity users." This is followed by the emphatic declaration that "such accidents as these are wholly preventible." Of course; but that is really not the point.

The real point comes out with an "if." It is explained that if a certain condition had existed, which was as a matter of fact lacking, the accident could not have occurred. It is open to anyone to expand the explanation, and aver with a certainty of not being contradicted, that if there had been no electric lighting in the building at all, there would have been no deaths from this cause. We are informed of what is the best system of wiring, having regard to the avoidance of risks of fatal shocks to the person; but it is admitted that there is a system of wiring "in common use," very like it, which is more dangerous than any other. The "Electrical Review" also deplores the accidents, which it admits "once more compel attention to the dangers which, under certain conditions, may exist even where they are least suspected." This is our point, precisely; and it is the sole consideration likely to weigh with the general public. It is to be remarked that this critic of the Fulham record does not think it necessary to look too minutely for the actual leakage of electricity which originated the danger. There was a defective lamp connection, it appears; but these things are never perfect. "Most probably the general leakage inseparable from a widely extended system of mains and installations" played some part in the general concatenation. A pleasant reflection! Not very reassuring, either, is the admission that it was impossible to measure, by any known test, the severity of the fatal shocks in this instance. The broad conclusion on the whole matter is that while the "accident was one the possibility of which the most far-seeing might overlook," it ought to have been impossible, and it would have been so "if" ordinary good practice had been followed. There is not much comfort, whatever the virtue, in this "if." The "melancholy Jacques" would be in his element in the editorial offices of our electrical contemporaries.

Naturally the electricians rage furiously against the absurd comments on the affair circulated by the newspapers. The cause of electric lighting, and especially of municipal dabbling in the business, has been so greatly favoured by the newspapers, that it smacks of blank ingratitude to complain of their exhibiting gross ignorance of the whole thing when it comes to such a crucial issue. Of course, the newspapers, and the usual amateurs who send them letters on such matters, know nothing whatever of the realities of the electric lighting business; but it is rather late in the day to offer any protest from the electrical side on this score, after the way in which this same order of "public opinion" has been worked for the advantage of the electrical interests and of municipal trading. Newspaper favour is a very broken reed for any enterprise to rely upon; but the electrical interest has all along made the most outrageous use both of it and of the same sort of assistance on the part of the busybodies on local authorities. What is now at stake is the reputation, not only of electric lighting from the point of view of public security, but of municipal works as being the best and most trustworthy of their kind. Where, it may well be asked, can the public feel really safe, if not in a municipal establishment, built and equipped under municipal supervision, and lighted electrically from a municipal station? This is the question of the hour. All the vague abstractions as to the surpassing merits of municipalism that have been blown up so industriously by the windy Progressives of the period, fail to screen the hard and ugly facts of these Fulham Baths fatalities from the frightened gaze of the public.

A last word on a technical point involved in this sad incident must be said: All the electrical opinion consulted agreed that if the conductors improperly involved in this "accident" had only been "earthed," no harm could possibly have been done. Doubtless; but what guarantee is there of the continued efficacious existence of this safeguard? If there is one thing in all the literature of lightning conductors more remarkable than other points, it is the failure of "earths" to justify themselves. Something more than so simple a prescription will be needed to restore public confidence in electricity supply, and municipal dealings in it, to the level occupied previous to the Fulham disaster. Of all conceivable municipal undertakings, promiscuous "electrocution"—the word has been so applied by the "Globe"—is the least likely to show a profit.

The electric lighting affairs of the Corporation of Kingston-on-Thames are quickly precipitating towards the inevitable climax of exposure of a most disastrous and uncalled-for municipal speculation. After a long resistance, which can only be adequately likened to that displayed by a porker on his compulsory way to market, the Corporation have consented to an independent expert inquiry into the whole state of this disappointing municipal property, which represents over one-third of the total indebtedness of what in other respects is a highly prosperous and flourishing borough estate. The unkindest comparisons are constantly being drawn in the local newspapers between the mistaken expectations of the infatuated Corporation when they first committed the town to this venture, and the painful realities of experience. There are plenty of keen eyes awaiting the report of the investigation, when it comes; and an interesting result may be confidently looked for.

THE TECHNIC OF LIGHTING.

The volume on the subject of public lighting which, as notified in the "Journal" last week, Mr. Dibdin has lately produced,* runs (with the index) to 537 pages of well-printed matter, besides tables, and is abundantly illustrated. Although naturally and necessarily some of the matter contained in it is based upon the substance of the earlier works of the well-known author, as "Practical Photometry," and various reports and papers which are within the recollection of the lighting engineer, the work before us is practically new, not only as to material, but also in arrangement and application to the construction of a systematic whole. We mention this for the reason that it is a duty to state, at the outset of a notice of this book, that it is decidedly one that no practitioner or student of the subject of lighting can be without. Mr. Dibdin has done good service to all the lighting

* "Public Lighting by Gas and Electricity." By W. J. Dibdin, F.I.C., F.C.S., &c., formerly Chemist and Superintending Gas Examiner to the Metropolitan Board of Works and the London County Council. London: The Sanitary Publishing Company, Limited; 1902.

industries by thus publishing the fruit of his unequalled experience; and when it has been said that the treatment of the subject is characteristic, there really remains nothing more to be offered by way of commendation of the work.

The first difficulty to confront anyone who thinks of writing a technical handbook nowadays is that of definition, which implies limitation. The time of comprehensive treatises on any of the great industries is past. Although encyclopædic works of this description exist, and are occasionally added to, the need of the age is really for sectional handbooks, which have the advantage of appealing at once to a wider reading public, while their authors can then specialize to the top of their bent. That is to say, the budding gas engineer had better look up his mathematics, his surveying and levelling, his ironwork construction, photometry, and so forth, in the writings of authorities on the subjects, instead of expecting to find all about everything in a treatise on gas. The latter kind of text-book has its own field of usefulness, if only to show how and why various special branches of knowledge are required by the gas engineer, as illustrated by the practice of the best authorities. But it is hopeless, from considerations of space and expense, to go behind every example of applied technic, and explain its source, in one and the same book. Here, in the very beginning of his labour, Mr. Dibdin appears to be in doubt as to what to include under the title of "Public Lighting." If this term were understood to describe only the lighting of streets and public places by suitable lamps, it is conceivable that a comparatively small book might contain all that would be strictly germane to the subject. It would be so, for example, in a treatise on gas or electricity, or oil-lamps. But this very limited meaning of the term need not necessarily be an author's choice. Mr. Dibdin takes a larger view of his subject, and tells the reader in the first lines of his preface that the scheme of his work has been "to collect together a series of representative facts relating to the production and utilization of light for public use." This evidently covers very much more than what is usually understood by public lighting. It may embrace the whole relationship of the public, as users of light for any purpose, with the producers and providers of the necessary means and appliances. Mr. Dibdin perceives this, and hastens to state that he wishes to confine himself to the results of lighting systems; referring to the proper sources of such information those who desire fuller particulars than he can find room for respecting the processes involved in the manufacture and supply of the illuminants. There may be differences of opinion as to the precise limitations which the author of a sectional work like this should impose upon himself; and we are not going to cavil at the somewhat wide liberty Mr. Dibdin has taken in regard to the inclusion in the book under review of incidental matter in which he happens to be interested.

In introducing his subject, Mr. Dibdin departs from the strictly historical order, discoursing first of the introduction of public lighting by electricity, with due mention of the exaggerated claims for candle-power which have been electrician's weakness from the beginning. Why, by the way, does he adopt the spelling "Swann" for the name of the English inventor of the incandescent electric lamp? In discussing together gas and electricity as sources of light, Mr. Dibdin makes a good point of ranking voltage with illuminating power as the important property in this regard. On the other hand, he allows himself to dilate upon the value of the incandescent electric lamp as a non-vitiator of the surrounding atmosphere, which consideration scarcely appertains, one would imagine, to any system of public lighting. Again, Mr. Dibdin recognizes the gravity of the "initial difficulty of inducing residents to incur the expense of wiring their houses" for electric light. But what has this to do with public lighting? Perhaps it shows the awkwardness of attempting to discuss the subject with too strict a regard for public lighting properly so called. That, however, lets in a host of other reflections. Mr. Dibdin feels the temptation, and to an extent yields to it. He discusses very instructively the origin and nature of flame luminosity and its uses; citing several authorities as testifying to the fact that photometric illuminating power and lighting effect are not necessarily equal. If the purpose of a light is to render surrounding objects visible, then an artificial light of low intensity (temperature) but considerable volume will serve. If the purpose is to enable colours to be distinguished, in a degree and in the same values as by daylight, then an intense light, of high temperature, containing blue and violet rays, is necessary. But the luminosity of this end of the spectrum is comparatively small. Mr. Dibdin refers to the distinguishing of black printed characters on white paper as a test for the comparative luminous effect of yellow and blue light; but this is not exactly a matter of public lighting. There is, however, a very important aspect of the same truth which is emphatically a question of public lighting; and that is the serviceability of different kinds of light in fogs. Curiously enough, Mr. Dibdin says nothing about this. The word "fog" does not appear in his index—which, by the way, is rather skimped. What of the action forced upon the Westminster Corporation, who use flare lights of the "Wells" type in dense fogs, to supplement (or supersede) the street arc lamps, at such times invisible? This is a branch of the subject in which the public authorities in such a climate as that of the British Isles need instructing; but Mr. Dibdin is silent about it. Perhaps he will see to it in a future edition of his book.

In explaining the law of "inverse squares," which is the rather loose name given to the first and fundamental law of photometry, Mr. Dibdin makes use of a diagram which is not the clearest we have seen applied to this purpose. It may be conceded, however, by anyone who has tried, that the explanation of the observed fact of the intensity of the light falling from a source upon a surface normal to the radiant diminishing as the square of the distance, is not easy to make perfectly clear. Perhaps the simplest way is to put the case of a light-source in the centre of an opaque sphere, with a window. There is an additional advantage in this method, that it can be further used to explain the operation of reflecting surfaces, such as mirrors. Public lighting authorities sadly need instruction on this head. There is a large trade in reflector incandescent electric lamps, which is based upon popular ignorance of the facts of radiation and reflection from a unit light-source. (There is no reference in the index to "spherical lighting.") The explanation of the operation of reflectors can come in very well in discussing the radiation of a central light-source upon the interior surface of an opaque sphere; and it is one well worth working out in a popular manner.

It should be a superfluous task to follow what Mr. Dibdin has to say on the subject of photometry; for if he is not a competent guide in the photometer-room, where shall one be found? Yet the best informed of us may fall into carelessness, occasionally. It is, for instance, hardly respectful to the amyl-acetate standard of light, which is the only one used in Germany, and is much admired by electricians interested in incandescent electric lamps, to dismiss it in thirteen lines of description and criticism. And, besides, the author omits to state what it really is, in terms of the English standard candle. He says that "the illuminating power of the flame is said to be equal to one standard candle;" but by implication he denies the fact. To leave the matter vague will just suit the importers of electric incandescent lamps stamped in Germany. It would have been better if the author had especially stated that the amyl-acetate standard, or "Hefner," is usually taken at 0·875 of an English standard candle. Mr. Dibdin is still persuaded that portable photometer testing of gas supply is the right and proper thing; but he omits to acknowledge that all the Acts of Parliament are against him. He does not, in this connection, distinguish between penalty testing and such testing as may help to detect imperfect distribution of gas in street mains.

The influence of Mr. Dibdin's long experience of photometry on his outlook over the gas industry is perceptible in some parts of his book. He writes as a photometrist first, as a chemist secondly, and as a provider of gas for the people not at all. He cannot get away from his laboratory tests, which inform him that the poorer a gas is, in the language of photometry, the more of it must be burnt to produce a certain given amount of light by means of a luminous flame. Nobody doubts it for a moment; but what if it does not matter, because consumers do not care to use luminous burners if they can avail themselves of incandescent gas-burners, which give tenfold the value for the money spent on gas? Oh! well, he admits, in that case it may be granted that the old ideas on the subject "must be very largely and seriously modified." But he does not go willingly with the advocates of these new-fangled notions of what gas is good for. He is a photometrist, and is fond of the art; and he has reproduced in his book all those elaborate diagrams showing how not to burn gas to the best advantage which so little impressed a Parliamentary Committee for whose behoof they were first prepared. Moreover, it is a pity that, before again circulating all this stuff—which is special pleading and nothing more—Mr. Dibdin did not pay heed to what was said about the effect of the reduced illuminating power upon the bills of the South Metropolitan consumers for the last summer half year. It is a mistake to keep those useless exercises in tabulation before the public. Besides, when Mr. Dibdin (on p. 123) speaks of the "very limited extent" to which incandescent gas-burners are used as compared with flat-flame burners, he pillories himself as one who has been "suckled in a creed outworn." His remark grows more out of date daily; and we venture to predict that future editions of his book will drop it out in favour of the improved views which have already carried the day for gas of low illuminating power. That so clever a man should have failed to see the sign of the times in this regard makes all this part of his book read very old-fashioned after Professor Lewes's latest lectures. There must be something odd about the vision of a witness who can say at best, for the incandescent burner, that "owing to the economy in gas which is able to be effected by the use of this burner, 'Mr.' George Livesey, of the South Metropolitan Gas Company, has been able to offer free of cost new lamps for old to the districts which his Company supplies." As this is a book on public lighting, it would have been more to the purpose if the author had explained carefully and fully exactly what has been done to improve the lighting of South London.

We have no space for detailing what Mr. Dibdin has to say concerning electric and acetylene lighting, but repeat that the book is very good indeed. But this is not to say that it cannot be materially improved in a future edition, by the author shedding some more of his old London County Council integument, and keeping more constantly before his eyes the kind of clients he assumes he has to instruct. There has been a good deal of work done in the field of public lighting which Mr. Dibdin does not mention at all. Of actual examples of street lighting, for instance he has none to give.

TECHNICAL RECORD.

THE GAS INDUSTRY AND THE MANUFACTURE OF CYANIDE.

In the last issue of the "JOURNAL" (*ante.* p. 35), we gave an abstract translation of the introductory portions of some articles by MM. Robine and Langlen in recent numbers of the "Revue Générale de Chimie Pure et Appliquée." At the close thereof, the authors proceed to deal with the direct extraction of cyanide from gas.

Although the existence of cyanogen compounds in gas was known long ago, having been mentioned in an English patent of 1850, it was not until recent years that any idea was entertained of turning them to profit, owing to their slight utility. The spent purifying material, or Laming mixture, which contained the principal part of the compounds was regarded as useless residue; and it was only in 1886 that a French manufacturer—M. Gauthier-Bouchard—thought of extracting prussian blue and potassium ferrocyanide from it, and produced a method for doing it. As these compounds are formed quite naturally, without requiring any special work on the part of the manufacturer, few improvements were made in this method. As soon, however, as cyanides were adopted for the treatment of auriferous ores, it was thought possible, especially in Germany, to make gas a profitable source for their extraction. It was very quickly found that the Laming mixture, or other analogous material, was only an imperfect vehicle for absorbing cyanogen compounds; and consequently investigators were led to extract them direct from the gas. In England and Germany the processes on these lines are now applied on a somewhat large scale. The ideal process for direct extraction from the crude gas—*i.e.*, as it leaves the retorts—would be to convey it into an alkaline solution, which would cause the formation of an alkaline cyanide. It is impossible, however, to carry it out, because, in addition to other impurities, the gas contains carbonic and hydrosulphuric acids, which are capable of displacing hydrocyanic acid, and consequently to prevent the formation of cyanide. An attempt must therefore be made to form combinations upon which carbonic acid or the sulphuretted hydrogen has no effect.

The first inventor who occupied himself with this question was Dr. Knublauch, who in 1877 had already undertaken an important series of investigations in regard to the cyanogen contained in illuminating gas. He was led during his studies to pursue a process for extracting the cyanogen compounds direct by the wet way. The gas is conveyed into washers or scrubbers containing one or more of the following substances in solution: (1) Ammonia, ammoniacal liquor, alkaline earths, magnesia, or carbonates and sulphites of these bases; (2) manganese, zinc, natural or artificial oxides, or hydrates or carbonates of these metals. Dr. Knublauch observed that carbonic acid and hydrosulphuric acid were not impediments, and that even if there were large quantities of these two gases in the gaseous mixture when it passed through a solution containing iron and an alkali, the cyanogen formed ferrocyanide so energetically that the affinity of the carbonic acid and sulphuretted hydrogen for the cyanogen was enfeebled to the extent of rendering insignificant the percentage of sulphuretted hydrogen absorbed. By this process, the gases must always pass through a liquid, which must be agitated during the passage of the gaseous current, which runs through a set of absorbing vessels arranged so that their numerical order can be easily changed. The amount of absorbing material to be used depends upon its nature. Generally, one molecule of alkali, alkaline earth, hydrate or carbonate should be employed per molecule of hydrocyanic acid, and a little less than one molecule of iron compound. The quantity of liquid should be at least sufficient to allow the gas to bubble.

The Gasch process, brought out in 1889, is based upon the utilization of recently precipitated metallic sulphides which form a ferrocyanide with cyanogen gas. The essential condition for success is the presence of ammonia. Transformation is the more rapid and complete in proportion to the height of the temperature, and it is instantaneous at 50° to 60° C. Moreover, the action of heat can be dispensed with when the reaction has commenced, which is effected by adding a cyanuretted precipitate obtained with a lye from a previous operation. The process is worked by the aid of ordinary washers, or by vertical ones, permitting close contact of the gas and absorbing material; and these appliances are placed at a point where the gas which passes through them has a temperature of not more than 36° C., at which sulphocyanides are formed. According to the inventor, the advantages of this process are the large yield of ammonium ferrocyanide and the great degree of concentration and purity of the cyanuretted lyes in a form favourable for subsequent treatment. The only impurities are a little ammonium and potassium sulphate. Herr Gasch also recommends the employment of liquors containing a metallic sulphide in suspension, like iron sulphide mixed with milk of lime, and solution of a salt (oxalate or alkaline and ammoniacal sulphate, sulphates of magnesia, alumina, iron, &c.). If, for example, a sulphate of soda solution, mixed with milk of lime and iron sulphide in suspension, is employed, a weak solution of ferrocyanide of sodium will be obtained, containing more or less sodium sulphide and deposit of sulphate of lime and calcium sulphide—both insoluble.

In 1892, Mr. Rowland endeavoured to absorb all or most of the cyanogen in the ammoniacal liquor of the scrubbers. With this view, he mixed with the water in these vessels an iron salt in such quantity that iron sulphide cannot be formed. The best proportion is found to be 5½ per cent. Ammonium ferrocyanide is produced and remains in solution, which is distilled after the addition of another proportion of salt or iron oxide, with the object of converting the ammonium ferrocyanide into a double ferrocyanide of iron and insoluble ammonium, which can be separated as follows: The liquor is mixed with milk of lime and filtered, then boiled, and sulphate or chloride of potassium added. Thus a double ferrocyanide of potassium and lime is formed. The same result can be attained by acidifying and boiling the liquor. The double ferrocyanide of potassium and lime is treated with carbonate of potash, which by calcination transforms it into alkaline ferrocyanide and carbonate of lime.

The process of Mr. Foulis, introduced in 1892, is somewhat similar. The gas, previously freed from ammonia, passes through a solution of alkaline carbonate containing oxide or carbonate of iron in suspension. Precipitated carbonate of iron is separated from the solution of sodium chloride by decantation, and placed in suspension in a carbonate of soda solution. This liquid is preferably employed in a scrubber furnished in several places with horizontal plates perforated with numerous holes, upon which rest tubes capped by a kind of mushroom forming a hydraulic fastening similar to the columns for the distillation and rectification of alcohols. The absorbing material, contained in a cylinder, provided with an agitator, flows continuously or intermittently in the scrubber, reaches the tubes, and falls into a compartment, and runs away by the arm of the apparatus. It flows against the gas moving in the opposite direction, and absorbs the cyanogen compounds therefrom.

The Claus and Domeier process (1895-6) is only a modification of the preceding. The absorbing material employed by these inventors is made by melting a mixture of iron, or oxide of iron, alkaline sulphate, and carbon. Thus a blackish-grey substance is obtained, only slightly soluble, representing a compound of iron and alkaline metal ($Fe_2 Na_2 S_3$). This material is pulverized, placed in suspension in water, and run into a set of washers, through which gas, freed from ammonia, passes. Ferrocyanide and sulphocyanide of sodium are formed; but the latter is not, it appears, favourable to the process.

Herr Schröder also proposed to collect the cyanogen compounds in ammoniacal liquor. The water utilized for absorption is mixed with ferrous chloride. The ammonia reaching this solution determines precipitation of iron oxide, with formation of hydrochlorate of ammonia. The sulphuretted hydrogen in turn transforms the hydrate of iron oxide into iron sulphide, which remains suspended in the absorption water with iron oxide. The ammonium cyanide in the gas then dissolves them, forming ammonium ferrocyanide. The liquor is subjected to distillation in presence of milk of lime to regenerate the ammonia; and ferrocyanide of calcium, slightly soluble, is formed, which is partially precipitated. That which is left in solution is thrown down by conveying through it a current of gas freed from ammonia and cyanogen. Carbonic acid determines the precipitation of the lime. A solution of iron perchloride can also be utilized, which throws down prussian blue. The precipitate of calcium ferrocyanide, prussian blue, and carbonate of lime is then treated, in a boiling condition, with potash or carbonate of potash, and ferrocyanide of potassium is formed which remains in solution, and is separated by filtration from the insoluble carbonate of lime.

The Teechmann process (1899) is based on similar reactions. The inventor recommends the employment of sulphate instead of chloride of iron. By placing a solution of sulphate of iron in the washers, this salt is at once transformed by sulphuretted hydrogen and ammonia into iron sulphide and sulphate of ammonia. The ammonium cyanide then acts on the iron sulphide, and produces ammonium ferrocyanide. Thus most of the cyanogen passes in solution, and a small portion is insoluble under the form of iron cyanide. The sulphide of iron is gradually dissolved as the cyanide of ammonium is absorbed; and by repeated additions of sulphate of iron, solutions of ferrocyanide of ammonium having a high percentage can be obtained.

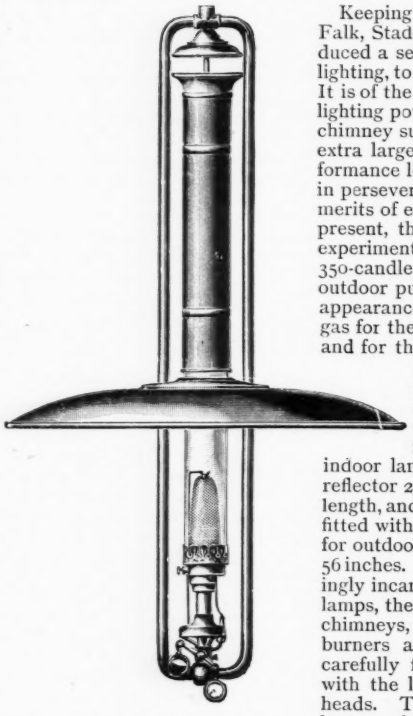
The authors conclude their observations on the type of process under consideration by mentioning that invented by Mr. Lewis, which is also based on the affinity of cyanogen or hydrocyanic acid for iron sulphide kept in suspension in an alkaline solution which gives a ferrocyanide. Practically, he recommends the following *modus operandi:* Sulphide of iron is obtained by precipitation of an iron salt by the aid of a liquid prepared from the waste gas coming from an ammonia still. It is kept in suspension in a washer of special form containing an alkaline solution with excess of soluble iron. The washer is constructed so as to permit close contact of the gas with the iron in suspension, and avoid formation of a less stable ferrocyanide. As far as possible, the ammonia should be extracted from the gas before it enters the washer, as the acids of the fixed ammonia salts form with the alkali an alkaline chloride which contaminates the product obtained. Theoretically, and working carefully with an efficient system of washer, there should be a certain definite reaction.

But, as Mr. Lewis has recognized, inter-reactions are produced, which are complicated and ill-defined. This is the defect inherent in all the processes which have been passed in review; and their perfect realization depends upon numerous circumstances of a chemical as well as a mechanical or physical order, which greatly modify results. The consequence is that, without great care and precautions, these are often far from satisfactory. Moreover these processes also present the great inconvenience of only yielding, in most instances, diluted solutions, subsequent treatment of which is very expensive. These are the reasons that have led to their being employed on only a limited scale.

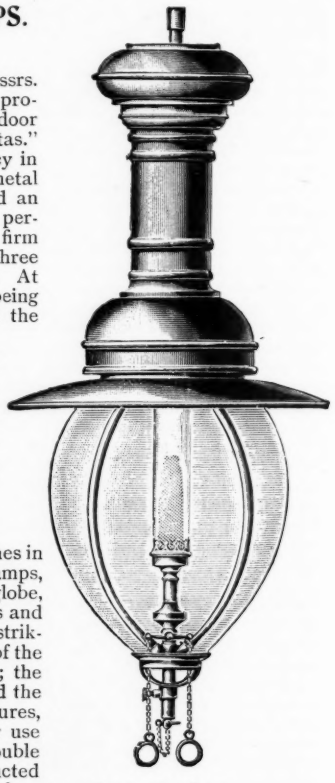
Very different, the authors go on to remark, is the method devised some years ago by Dr. Julius Bueb, which is now worked by the German Continental Gas Company. Most readers of the "JOURNAL" are familiar with this process, which differs from those of Herr Knublauch and others in this, that by the reactions employed an insoluble compound (instead of a soluble ferrocyanide) is obtained. MM. Robina and Lenglen give a detailed description of the process; but it is unnecessary to reproduce it here. It should nevertheless be recorded that they recognize in it a very definite step forward in the extraction of cyanogen from gas, judging it merely by the results realized; for whereas by the old method only 50 to 60 per cent. of cyanogen was obtained, the yield by the new one is almost 100 per cent. Moreover, the cyanogen is extracted in a very convenient form, as the products are sufficiently condensed to bear the cost of transport, if the manufacturer cannot or will not convert them into cyanide. It will probably be remembered that Dr. Bueb contributed a paper on this subject to the International Gas Congress in Paris in 1900, on which occasion Dr. A. Smits, without any previous acquaintance with the Bueb method, confirmed, by experiments made at the Amsterdam Gas-Works, with a similar process, the results obtained by Dr. Bueb at Dessau.* This coincidence justifies the conclusion that the problem of the direct extraction of cyanogen from gas has been solved both simply and profitably.

The authors next deal with the subject of the extraction of cyanogen compounds from ammoniacal liquor; but this portion of their work must be left for future notice.

THE "VERITAS" SELF-INTENSIFYING GAS-LAMPS.



INDOOR LAMP.



OUTDOOR LAMP.

Keeping to the fore in meeting the demands of the time, Messrs. Falk, Stadelmann, and Co., of Farringdon Road, E.C., have produced a self-intensifying gas-lamp for both indoor and outdoor lighting, to which they have applied their trade name of "Veritas." It is of the type of lamp which depends for its high efficiency in lighting power upon a specially constructed burner, a long metal chimney superposed above the ordinary glass chimney, and an extra large mantle; and an examination of the lamp and its performance leaves no room for question as to the safety of the firm in persevering with the claims they have put forward to the three merits of excellent lighting power, strength, and cheapness. At present, the lamp is made in two sizes (a smaller one is being experimented with now); and the illustrations represent the 350-candle type for indoor lighting and a suspension lamp for outdoor purposes. The next size (which is very similar in appearance) is of 500-candle power. The consumption of gas for the 350-candle power lamps is 15 cubic feet per hour; and for the 500-candle power lamps 23 cubic feet. In respect to these figures, the firm point out that they have rather understated the value obtained for the consumptions named, as they prefer not to attribute a duty to the lamp that they cannot fully and constantly substantiate. The smaller indoor lamp is 39 inches in length over all, and has a reflector 23 inches in diameter; while the larger one is 51 inches in length, and has a reflector 24 inches in diameter. The same lamps, fitted with double enamelled casing, and the arc-light type of globe, for outdoor suspension have lengths respectively of 46 inches and 56 inches. The mantles of the lamps seen in operation were strikingly incandescent from bottom to top. As to the strength of the lamps, the harps or framework are made of wrought iron; the chimneys, casings, and reflectors are of enamelled iron; and the burners are substantial and highly finished brass structures, carefully fitted for adjustment. The mantles supplied for use with the lamps are the "Veritas" XXX. quality, with double heads. The lamps are also fitted to specially constructed lanterns for use on ordinary street-lamp columns; and these lanterns look particularly serviceable. The frame is of cast iron, the frog and ladder rest of wrought iron, and the hood, chimney, and reflector of enamelled iron. The lamp has a very pleasing appearance; and in regard to price, it strikes one as being good value for the figure asked.

LIGHTING BY ALCOHOL.

At a recent Meeting of the Société des Ingénieurs Civils de France, M. Arachequesne presented an interesting communication on the above subject, of which the following is an abstract translation.

The main question of lighting by means of alcohol has been definitely set at rest by the Industrial Alcohol Exhibitions held in Paris in November, 1901, and May, 1902, the latter of which proved a veritable triumph of lighting by the new agent; and it now only remains to determine the best solutions of the problem, from the standpoints of safety and economy. Security against fire and explosion is greatly increased in most of the appliances at present available; and, indeed, the safety would be absolute in those which received the higher awards at the exhibitions, were it not for carelessness and the unforeseen. Even now it is not too much to assert that appliances utilizing alcohol are less dangerous from explosion than those burning gas or rectified petroleum, and also that, in the event of fire, alcohol flames are more readily extinguished than are those of petroleum, because water, generally present, suffices in the former case, whereas sand, which is not so readily available, is required in the latter.

Whether for lighting or for heating, the alcohol must be burnt, which is not a difficult matter. But the manner in which it is burnt divides the appliances into two main classes, in which there is either direct ignition of the liquid, or ignition of the alcohol previously converted into gas. The former class again comprises closed appliances, in which the spirit is burnt at the end of a cotton wick; while the one with round wick is that which was first applied to lighting. The type of lamp with what is called the Berzelius wick has been variously applied to incandescent lighting. Both receiver and burner approximately resemble those of the paraffin lamp with round wick. But there is central air admission; and above the wick a special arrangement of the glass-carrier permits of placing an incandescent mantle above the flame. The Schuster and Baer, Welsbach, and Emka burners only differ in regard to the manner in which the glass-carrier and mantle are mounted.

Great expectations were formed as to a new method of alcohol lighting, owing to a wonderful advantage it possesses exclusively —viz., that of immediate lighting and coming to incandescence. But unfortunately this advantage is counterbalanced by serious drawbacks. In order to obtain the high temperatures required for incandescence, it is necessary, for insuring the draught, to employ very lofty glass chimneys, so that the alcohol consumption for a given light is practically doubled. Again, if the lighting is instantaneous, the definite regulating of the wick for obtaining a good utilization, or for avoiding a deposit of soot on the mantle, occupies several minutes, as in the old moderator lamp.

The appliances which burn alcohol previously brought to a state of vapour are veritable gas-works, in which the retorts and

* See "JOURNAL," Vol. LXXVI., pp. 700, 701.

pipes are replaced by a small boiler for gasifying the spirit. The distinguishing feature of these appliances is the method by which the boiler is supplied—whether by wicks or by pressure—and especially the manner in which it is heated. The latter, indeed, permits of dividing appliances of this class into four sections—viz., those in which the alcohol is converted into gas by (1) a pilot-light, (2) a branch flame, (3) the main flame, or (4) by regeneration through conduction.

1.—*By Pilot-Light.*—All the lamps having pilot-lights are fed by wicks from a receiver at a lower level; and it is evident that giving the pilot-light a greater or less intensity brings about more or less volatilization. This arrangement has been embodied in a great many lamps; and among them may first be mentioned the "preferred burner" (*bec préféré*) of the Société Continentale Nouvelle, of which a vertical section is shown in fig. 1.* The wicks MM enclosed in cases of segmentoidal cross-section, terminate in the boiler C, to which they lead up methylated alcohol. These wicks (as also those in the lamps next to be described) must be considerably compressed, especially at their upper part, to avoid the ill-effects of counter-pressures. Below the boiler is a small wick *m*, for the pilot-light, which, burning constantly, but adjustable nearer to, or farther from, the boiler, ensures gasification. The gas issues briskly by the injector I, drawing along with it the air necessary for combustion, and burns at the end B, of the burner in contact with a Welsbach mantle. The pilot-jet is first started; and, a minute afterwards, a light is applied to the upper part of the glass surrounding the burner—the alcohol gas being lighted just like ordinary gas.

By Branch Flame.—Some makers have substituted for the pilot-light a branch flame led from the boiler by the copper pipe; the lighting and starting of the vaporizer being in this case effected by a wad soaked with spirit. An arrangement of this kind is the new "Posno-Régina" burner, which, though a little less economical, according to photometric tests, than the preceding, when properly regulated avoids waste of alcohol in ordinary use, if entrusted to careless or inexperienced hands.

By Main Flame.—Besides the Washington and Kornfeld lamps, which have already been described and illustrated in the pages of the "JOURNAL,"* this section includes the "1900," "Monopole," "Simplex," and other burners. The "1900" burner of the Société Continentale requires that the alcohol supply shall be under considerable pressure. On reference to fig. 2, it will be seen that the alcohol enters the tube A (stuffed with metal wicks), penetrates into the vaporizer S in the middle of the flame, issues by the ejector I, where it draws along the air necessary for combustion, and then returns to the burner B. By arranging three of these

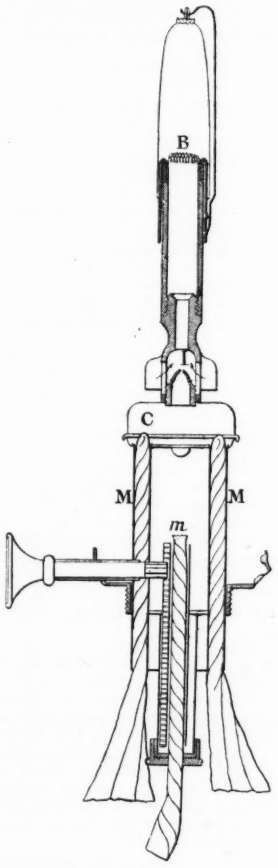


FIG. 1.

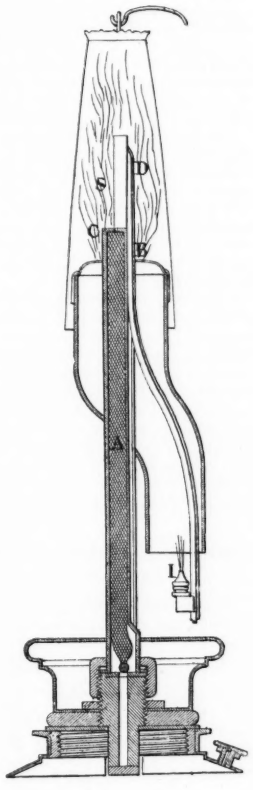


FIG. 2.

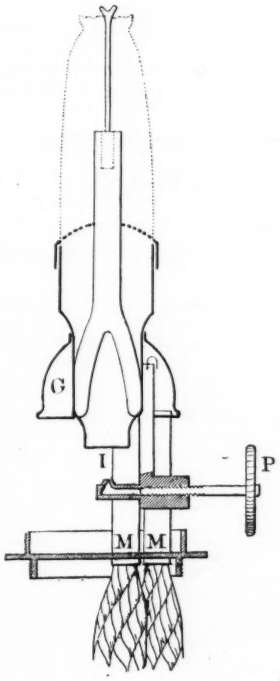


FIG. 3.

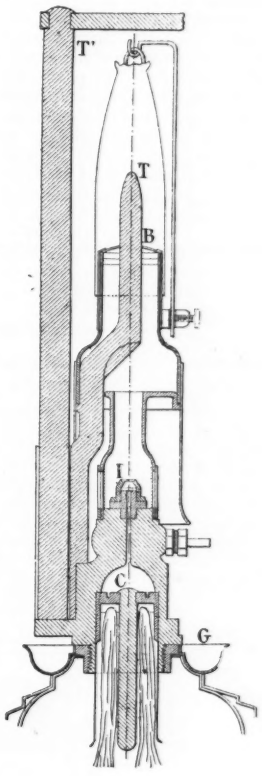


FIG. 4.

burners in stoves of the salamander type, and placing asbestos briquettes above the flames, the Company have produced an effect similar to that obtained with gas-stoves, while the combustion products have been carried off.

In the "Monopole" burner, alcohol is contained in a receiver which is placed by means of a tube and a cock worked by a rod in communication with a smaller receiver below, and then rises in tubes filled with asbestos wicks and warmed by the waste heat of the burner. The vapour thus produced again descends to the burner by side tubes. For the first ignition, a circular dish has been contrived in the metal chimney above the glass; and at the same time that, by pulling a chain, the cock is opened, a cavity therein delivers 3 cubic centimetres (0·183 cubic inch) of alcohol by a small capillary tube, the spirit being lighted through an opening afforded by a cone. The lamp may then be raised to its place, when the alcohol in the dish warms the asbestos-filled tubes, and burns just long enough to ignite the gas directly it issues from the burner—viz., from 45 to 75 seconds after being lighted, according to the temperature of the outer air.

In the "Simplex" burner, which is suitable for indoor lamps, gasification of the alcohol is effected by its rising in a round wick, contained in a perforated tube, surrounded by another tube closed at the top. The vapour issues at the bottom by the small holes while drawing in air by two apertures; the mixture entering into combustion at the top of the burner.

By Regeneration.—In the lamps in this division the vaporizer is heated by the regeneration of part of the heat by means of the conductibility of a metal rod surrounded by the flame, as in the Decamps burner shown in fig. 3. For lighting this lamp, the vaporizer G, supplied by the wicks MM, is heated for a few seconds by means of a wad soaked in alcohol, after which the pointed plug P is opened, when the vapour issues by the ejector I, and proceeds to the burner; the conductibility of the rod ensuring the subsequent heating of the vaporizer. For extinguishing, a closing of the plug P shuts off the supply of alcohol from the ejector, by putting the vaporizer in communication with cold alcohol in the receiver, causes the vapour to become condensed therein, so that extinction follows at once.

In the arrangement that is adopted by M. Denayrouze (fig. 4) the part C is heated by double regeneration, due to the inside rod T and the outside bracket T^1, from which the mantle may be suspended. G is the dish which serves for first lighting. This burner permits very great luminous intensity to be obtained with

*The illustrations used in this article are reproduced by permission from the "Bulletin" of the Société des Ingénieurs Civils.—ED. J.G.L.

* See Vol. LXXX., pp. 149, 215.

slight expenditure of spirit, especially in types of lamp burning carburized alcohol under pressure. The demonstration which took place in the Salle des Fêtes at the May Exhibition proved the high power that can be attained by this system; but, on the other hand, for small sizes of lamp especially, the outside bracket is considered to be a detriment, as it throws a line of shade.

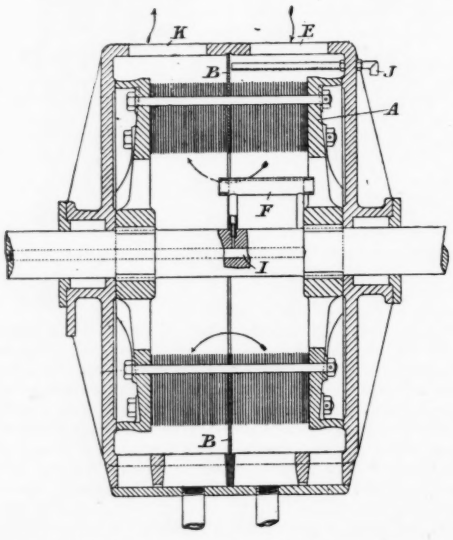
In the Hantz burner, the alcohol, which is under a pressure of about 2·8 lbs. per square inch, penetrates, by a capillary tube, into a pipe forming the vaporizer, which is heated by a rod; the vapour issuing by the injector, and traversing a U-shaped gas and air mixer to reach the burner. This type of lamp, which is also of great power, is noticeable for the steady light it affords, notwithstanding the fact that compressed air is used for combustion. This result is obtained by the application of an expander, which maintains a constant pressure in the spirit receiver.

Conclusions.—In addition to the general principles here set forth, there still remain a few questions of detail to be solved and certain facts to be explained, the causes of which are as yet unknown—for instance, the part played by cotton wicks. In the case of the Decamps lamps, which are noticeable for the regularity of their manufacture, out of ten burners there may be eight or nine which give excellent results, with economy and without trace of heating; while one or two will have a tendency to heat and burn an excess of alcohol. It is sufficient to change the wick to render this lamp equal to the others; and yet the wick, which is of exactly the same weight as the others, is taken from the same packet of cotton. Why, then, it may be asked, should there be this difference? The quality and form of the incandescent mantles also play a large part in the economical yield. Conformably with theory, lamps burning carburized alcohol are more economical than those using methylated spirit. Yet the latter is to be recommended for domestic use, owing to its great safety; while carburized alcohol appears to be preferable for very intensive public lighting, especially in cold countries. Two *desiderata*, very important for the future of industrial alcohol, are that the method of denaturization should be improved, and a greater freedom given to the carriage of debased alcohol. When these are obtained, alcohol may take a very important place in lighting and heating, without, however, interfering with gas or even with petroleum.

REGISTER OF PATENTS.

Extracting Tarry Matters from Gas.—Pease, E. L., of Darlington. No. 23,362; Nov. 19, 1901.

This invention relates to apparatus for extracting tarry matters from coal gas or dust from waste gases of blast-furnaces, by introducing the gas at the periphery of a drum (revolving at a high speed), made up of finely divided sections formed by a series of circular plates closely pitched, and extending in a radial direction as far as desired, and into which water is sprayed. The centrifugal force generated by the drum will so act on these heavier particles in the gas that they will not be able to follow the gas through spaces or sections within the drum, through which the gas is drawn by the exhauster against the centrifugal influence of the drum.



In the arrangement shown, the drum A is divided into two compartments communicating one with the other by a division-plate B, so as to form a damp chamber to the right and a drying chamber to the left. The drum, mounted on a centre-shaft, revolves at high speed; the whole being enclosed within a suitable casing. The gas is introduced into the drum at E, with a water spray F internally applied. The drum is made up in sections of suitable material forming a series of circular plates or inlet and outlet discs, spaced some distance apart and fixed to the drum by spindles extending from one side to the other. The gas-inlet compartment is supplied with water, while the other, or gas-outlet, in which the gas passes from the interior to the exterior, is dry, the object of which is to dry the gas by centrifugal force. To effect this, the centre-shaft is furnished with a hole or perforation I, into which water circulates for supplying the inner spray F; and four sprays J are fitted round the inlet discs only for supplying water to the outside of the discs. Inlet-sprays are provided near the inlet, not shown. By fitting water-sprays internally and externally, the water strikes the inner and outer edges of the discs. The centrifugal force of the drum will so act on the heavy particles in the gas that they will not be able to pass with the gas through the spaces in the drum. The left section of the discs acts as an exhaust itself, and balances the resistance offered by the other section to the passage of the gas; it also acts as a fan or exhaust engine. In the case of a separate exhaust, the gas is drawn through the outlet K in the opposite direction to the centrifugal influence of the drum; and the difference in specific gravity of the gas and tar is made use of to a greater nicety than when both are made to travel in the same direction.

Manufacture of Pitch Compounds or Substitutes.—Wilton, G., of Mark Lane, E.C. No. 2292; Jan. 28, 1902.

This invention consists chiefly in mixing with tar which has been distilled or not, or with tar oils, soft pitch, petroleum oils, or residues (the term "petroleum residue" including oil-gas tar), a suitable quantity of coal dust, bituminous coal dust, or it may be bitumen. The mixture is then distilled in the ordinary way, or may be heated or digested to the required extent to produce the pitch compound or substitute.

In carrying the invention into effect, the procedure would be as stated in the following examples:—

Example I.—Add to coal tar a suitable quantity (say, 30 per cent.) of ordinary coal dust, bituminous coal dust, or it may be bitumen. The ingredients are well mixed together by any suitable means; and the mass is then distilled in the way usually adopted for obtaining ordinary pitch, or in any other suitable way.

Example II.—Ordinary coal dust, bituminous coal dust, or bitumen may be mixed thoroughly with a heavy tar oil—such as creosote oil or anthracene oil; a suitable proportion being equal parts by weight. The mixture is then subjected to sufficient heat or digested to cause the coal dust to soften and become intimately united with the oil, so as to constitute a compound of pitchy nature and consistency. The hardness can be increased by distillation if required, or the product may be purified by allowing it to settle, and the thin pitch run off and hardened by distillation.

Example III.—Petroleum oils or residues may be substituted for the oils mentioned above; the proportions being varied to suit the circumstances. For instance: Equal parts by weight of crude petroleum and ordinary coal dust, bituminous coal dust, or bitumen may be employed, or equal parts by weight of a petroleum residue—for example, oil-gas tar and coal dust, bituminous coal dust, or bitumen.

Example IV.—As another example, add to the substance known as soft pitch a suitable quantity of bituminous coal dust or bitumen, and heat the mixture approximately to the boiling point of the pitch, and thus obtain in an economical manner hard pitch from soft pitch. A suitable proportion of bituminous coal dust or bitumen for this purpose may be stated as 1 part by weight to 3 parts by weight of the soft pitch.

Adjustable Anti-Vibrating Fittings for Incandescent Lights.—Helps, G., of Nuneaton. No. 2537; Jan. 31, 1902.

This invention relating to adjustable anti-vibrating fittings for incandescent and other gas-lights, consists in the use of metallic or other flexible tubing and a special arrangement of sheaths, pulleys, and friction rollers, and revolving brackets in connection therewith. The flexible tubing is used both for the gas supply-pipe as well as an adjustable suspender of the fittings themselves.

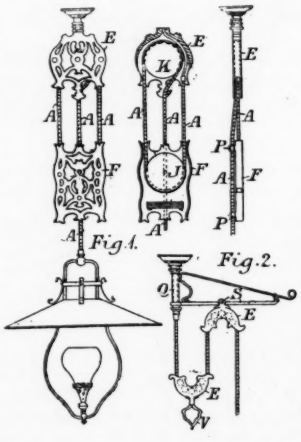


Fig. 1 shows an adjustable pendant in which the flexible tubing A takes a central position, and the burner hangs under the centre of the ceiling plate. The upper sheath is shown at E, and the lower sheath (containing the counterbalance weight) at F. The flexible tubing is attached to a specially screwed connection, to which the gas is conveyed through a tube or passage arranged in the sheath itself, and passing downwards around the lower wheel J, and thence upwards and over the upper wheel K, fixed in the upper sheath, thence over a small friction roller downwards outside the sheath F, and so to the burner. The guides to keep the tubing in a central position, are shown at P.

Fig. 2 is another form wherein the flexible tubing is connected to the ceiling plate by means of a gas-tube inside a long sleeve or neck Q, having a bracket attached to it in such a way as to allow it to revolve on the inner gas-tube; while at the same time the upper sheath E, having attached to it a small friction roller at S, can be caused to travel along the portion of the bracket formed by the rail, and the fitting can also be raised and lowered at will—the balance-weight V keeping it suspended in any position. The sheaths are fitted with friction rollers.

Houses for Inclined Retorts.—Dempster and Sons, R., and Broadhead, J. W., of Elland. No. 2617; Feb. 1, 1902.

In houses for gas-retorts where the coal is raised by an elevator and delivered by a longitudinal conveyor to a continuous series of hoppers, from which the coal is fed to the retorts, although attempts have been made to dispense with the conveyor and continuous hoppers—using instead only large central hoppers—it is found in practice (say the patentees) that the required storage of coal can best be obtained by the use of a conveyor and series of hoppers as described. Where the retorts are of the inclined type, the height of the retorts themselves, the hoppers, and the conveyors above them, must be considerable; and where these have all been under the main roof of the building, or even where the conveyor has been placed between some of the members of

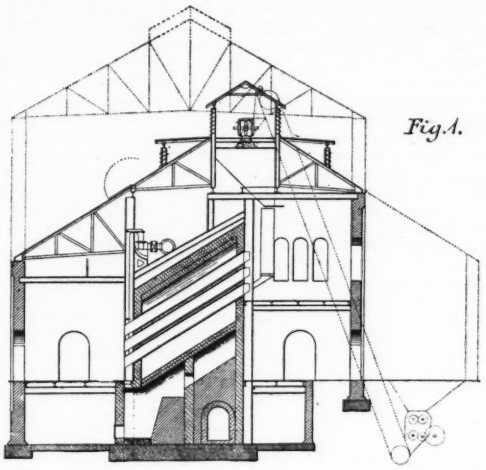


Fig.1.

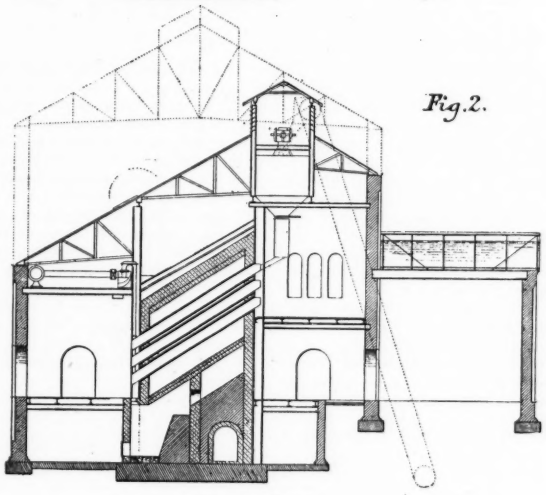


Fig.2.

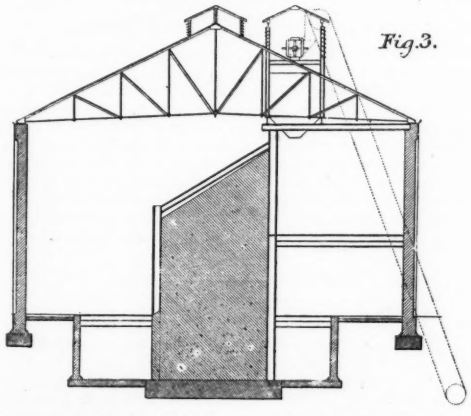


Fig.3.

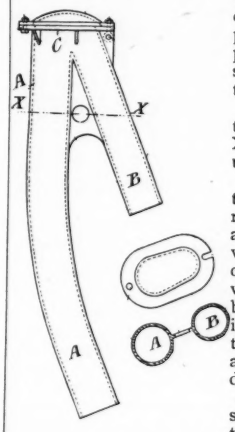
the roof principal, the wall from which the roof springs has been, say, 50 feet high, and necessarily of much stronger construction than a wall of, say, 30 feet. By their present invention, they propose that the hoppers themselves should be placed in the roof; the sides of the hoppers forming part of the roof principal, or the roof principal springing from the hoppers. In adapting an old building, the hoppers would be placed between the principals of the roof; and in both cases the conveyor would be arranged outside—if centrally, it would be within an ordinary roof ventilator, or else covered in with a small light separate roof.

Figs. 1 and 2 are sections through new retort-houses, in which the hopper and conveyor are placed at the apex of the roof. In these figures, the roof principals spring from the sides of the hoppers, which thus practically form a part of the roof. The conveyor is in both cases placed in the ventilator, which may (if necessary) be made higher and wider than usual above the main roof. The dotted lines indicate the height which the building would require to reach if the hopper and conveyor had been placed under the main roof.

Fig. 3 is section through an old building adapted for an installation of inclined retorts. In this case, a series of hoppers are placed between the principals of the roof. The conveyor is outside the roof, and if at the apex of the roof would be covered by the ventilator. In the example shown, however, as the conveyor and hopper are at one side of the apex, a light structure is built over them, which is capable of being used as an additional ventilator.

Arch-Pipes.—Woodall, H. W., Head, H. C., and Green, W. H., of Bournemouth. No. 12,730; June 4, 1902.

The patentees' proposal is to form an arch-pipe consisting of two members—that leading from the ascension-pipe being curved and entering directly (and at an acute angle) into the other, which is vertical and leads to the dip-pipe; the members being closed above their point of junction by a single detachable cover so disposed as to permit access to both of them.



The illustration shows a side elevation of the arch-pipe, with a cross section on the line X, and a top plan of the cover for closing the upper end of the arch-pipe.

At the junction of the members A and B, there is constituted a space or chamber, arranged obliquely so as to provide sufficient area to allow for the passage of a large volume of gas from A to B. The upper edge of this chamber is cast with a flange C, on to which is bolted the cover, which is strengthened by ribs. The cover is slightly concave on its innner surface, so as to more readily guide the gases, tarry vapours, and the like, or around the junction of the pipes and into the dip-pipe.

Obviously (say the patentees) this construction of arch-pipe will permit of the gases, tarry vapours, &c., entering directly from the ascension-pipe through the arch-pipe into the dip-pipe, without having to pass along any inclined or intermediate portion or bend, and the tar, &c., to be distilled over without fear of choking the pipe. Should, however, the arch-pipe become choked, it will only be necessary to loosen the nut of the swivelling screw and the nut of the bolt and turn the cover to one side.

APPLICATIONS FOR LETTERS PATENT.

28,208.—Lauder, G. M., "Acetylene gas-burners." Dec. 22.
28,212.—Steele, W. F., "Gas-making apparatus." Dec. 22.
28,214.—Sprague, H. H., "Gas-meters." Dec. 22.
28,220.—Stegmüller, G., "Illuminating lamps." Dec. 22.
28,251.—Wilton, T. & G., "Distillation of ammoniacal liquors." Dec. 22.
28,318.—Helps, G., "Gas-burners and mantles." Dec 23.
28,319.—Helps, G., "Anti-vibrators for incandescent gas-lights." Dec. 23.
28,359.—Hunt, C. W., "Conveyors." Dec. 23.
28,415.—Lindemann, O., "Internal combustion engines." A communication from from E. Körting. Dec. 23.
28,463.—Sentinella, R. L., "Supporting incandescent mantles." Dec. 24.
28,474.—Zimmer, G. F., "Conveyors." Dec, 24.
28,493.—Stierli, F., "Self-lighting gas-burners." Dec. 24.
28,563.—Boult, A. J., "Incandescent burners." A communication from C. Hubert. Dec. 24.
28,591.—Cottrell, H. R., "Prepayment machines." Dec. 27.
28,596.—Thompson, W. P., "Loading and transferring coal." A communication from W. P. Davis. Dec. 27.
28,614.—Beilby, G. T., and Christison, G., "Removing tar and solid particles from fuel gas." Dec. 27.
28,666.—Harwood, H. T. & A. J., "Retort settings." Dec. 29,
28,689.—Schmitz, W. J., "Incandescent gas-lamps." Dec. 29.
28,695.—Onslow, A. W., "Burners for high-pressure gas lighting." Dec. 29.
28,720.—Carter, G., and Parkinson, W. C., "Coin-freed gas-meters." Dec. 29.
28,725.—Armitage, S. R., and Ainsworth, J., "Self-extinguishing lamps." Dec. 30.
28,813.—Bronder, G. A., "Gas-retort charging apparatus." Dec. 30.
28,827.—Clerk, D., Bradley, H. W., and Bickerton, H. N., "Internal combustion engines." Dec, 30.
28,832.—Smith, G. B & E. W., "Coin-freed gas-meters." Dec. 30.
28,877.—Hislop, G. R. "Gas-producers." Dec. 31.
28,882.—Fletcher, Russell, & Co., Ltd, and Neil, W. R. & J., "Gas cooking-ranges." Dec. 31.
28,911.—Pinchbeck, J., "Prepaid gas-meters." Dec. 30.
28,914.—Smith, Watson, and Hinchley, J. W., "Recovery of ammonia from gaseous effluents containing it." Dec. 31.
36.—Grossmann, J., "Manufacture of cyanides." Jan 1.
66.—Barber, T. W., and Dobbs, A. E., "Pipe couplings and joints." Jan. 1.
69.—Zehnpfund, K., "Incandescent burners." Jan. 1.
84.—Boistelle, A. O., "Measuring and mixing gas." Jan. 1.
109.—Brown, T. B., "Mantles and burners used in incandescent gas lighting." Jan. 2.
153.—Hall, F., "Burners for incandescent lighting." Jan. 3.
166.—Lea, J. W., and Perrins, J. H., "Galleries for incandescent gas-burners." Jan. 3.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Honorary Membership of the New Institution.

SIR,—Will you kindly grant me space in your columns to inform those interested that the Council of the Institution of Gas Engineers have considered the applications for membership received on Form A, in accordance with the Articles. Those received from members of the old Societies ineligible under Clause 4 of the Memorandum of Association (a comparatively short list) were dealt with under Article 5 (subsection II.); and the result of the ballot shows that two gentlemen were elected. To them, and all who have been elected to the various classes of membership, letters have been sent notifying them of the fact.

It should be stated that the date by which all ballot-lists were returnable was Monday, Dec. 29, 1902, and that applications from gentlemen residing outside the limits of Europe have yet to be considered at a meeting of the Council to be held after March 31, 1903, in accordance with the Articles.

Croydon, Jan. 10, 1903. J. W. HELPS, Hon. Sec.

SIR,—Your print of the letter I sent to you is not correct. The words "and besides this" have been printed in place of the words "but secondly."

Perhaps you will kindly clear up the discrepancy as it imports unnecessary ambiguity into my letter.

Jan. 8, 1903. HY. E. JONES.

[Mr. Jones is quite right. The words "and besides this" were printed in place of "but secondly;" but we fail to see that the change introduces any "unnecessary ambiguity" into our correspondent's letter, nor does it in any way alter the sense of what he wished to convey. In order that readers may judge of this for themselves, we reproduce the paragraph precisely as it appeared in Mr. Jones's typewritten letter, even to the punctuation:

The postscript to Sir George Livesey's letter is written under some misapprehension. When the Rules had to be legally framed upon the Resolution and the practice formulated to follow the Resolution, two things were found to arise,—first, that the Members of the dissolved Institutions should be invited to re-apply, which they have done, and been duly admitted to a very large number,—nearly seven hundred—, but, secondly, some of the former Members who were not eligible to the ordinary classes, also applied. Then there came the necessity for submitting each to the ordeal of the two-thirds majority vote, but it by no means follows that because through their own action the List was necessarily a long one, as a "sequitur" they must all be elected.

Mr. Jones's letter, we fear, was rather hastily dictated. Before our unfortunate attempt at editing the composition, our correspondent had had a turn; and to show that a little further revision on our part was perhaps desirable, it may be mentioned that the last paragraph of the letter commenced with the words: "It may appear *superlative* for me to express this." Well, we ventured to alter "superlative" into "superfluous." But as to the alteration about which complaint is made, the use of the conjunction "but" instead of "and" was somewhat misleading; and it seemed to us that the proper "secondly" was the "necessity for submitting each to the ordeal of the two-thirds majority vote." Really, when Mr. Jones's method of stating the position is analyzed, instead of merely two things arising, he shows that something like half-a-dozen things arose: First, there was the invitation to re apply; secondly, the application; thirdly, the admission of a very large number; fourthly, the application of some of the former members who were not eligible for the ordinary classes; and, fifthly, the necessity of submitting them to the two-thirds majority vote. Under such circumstances, we may be pardoned for thinking that an error had been made in introducing the word "secondly" where it stood, and for preferring to leave the "secondly" a matter of open choice, without affecting the writer's meaning. The words "and besides this" still appear to be in every way as good as the words "but secondly;" and we dispute that they import into the letter any "unnecessary ambiguity." It would be interesting if our correspondent would explain how, in his view, they obscure his meaning.—ED., J. G. L.]

Inclined v. Horizontal Retorts.

SIR,—Now that Mr. Goodson has kindly answered my questions regarding his shifts and rate of wages, I will analyze and compare the figures he has given with regard to his own cost of working at Heckmondwike compared with that at Bury, which appeared in his letter in the "JOURNAL" of Dec. 23, p. 1696. In comparing these figures, I must first of all point out to Mr. Goodson that it is almost an impossibility to compare two works of dissimilar sizes, owing to the varying circumstances and conditions at each, as, from my varied experience, I have never yet discovered two gas-works in different localities with exactly the same conditions.

Dealing first of all with the question of getting coal into the retort-house, I find from a perusal of the "JOURNAL" for March last (p. 565), that Mr. Goodson satisfactorily answers this point himself, by stating that the getting of the coal into his retort-house costs him nothing. Note his own statements:

Our coal is carted into the works and tipped by the carter into a hopper holding about 12 tons, let into the ground over the breaker; and it is automatically fed into the breaker and elevator. Therefore, our coal unloading and elevating costs nothing beyond the occasional starting and stopping of the steam-engine operating the plant. . . . Our overhead coal-hoppers hold 36 hours' maximum requirements; so that the coal plant need not be run on Saturday afternoon, Sunday, or at night.

It must therefore be borne in mind that, when comparing the Bury cost of 1s. 1½d. per ton against which Mr. Goodson makes his comparisons, there is included the charge of 1·38d. per ton for coal men getting the coal from the stores into the retort-house, which must be deducted, as in the case of Heckmondwike it costs nothing. Under the circumstances, thisis an exceedingly low figure. But when it is remembered that the coal-store is at one end of the works and the retort-house at the other, and that the coal has first of all to be elevated and stored, and then elevated and conveyed again through an old retort-house, it will at once be seen that it is difficult to compare the cost of working at the two works under this heading.

Then as regards the shifts, I assume from Mr. Goodson's reply in this week's "JOURNAL" that he is working two shifts per 24 hours. From information that has been taken from the carbonizing accounts at Bury to-day, I find that for some time past Mr. Simmonds has been carbonizing 910 tons of coal per week with his twelve through settings of retorts, and that the total cost of wages per week for three 8-hour shifts, including time-and-half for Sunday, amounts to £50 13s. 6d., or at the rate of 13·36d. per ton of coal carbonized for getting the coals from the stores to the retort-house, the working of the charging and drawing machines, firemen, pipe-jumpers, coke elevating and conveying men, and exhauster and boiler attendants.

To accurately compare the cost with the Heckmondwike working, we must first of all deduct the Bury cost of getting the coals from the stores into the retort-house, and add the cost for exhauster and boiler men, which were not included in my former statement, viz.:—

Cost at Bury with 8-hour shifts .	13·36d.	per ton of coal carbonized.
Deduct cost of getting coal from stores into retort-house . .	1·38	,, ,,
	11·98d.	
Add for exhauster and boiler men	1·34	,, ,,
Total cost, 8-hour shifts . . .	13·32d.	

If two shifts were worked at Bury, the same as at Heckmondwike (which for the sake of comparison in this case is the only correct basis to work upon, and which system is still being worked upon in many cases where the custom of 8-hour shifts has not been established), the cost at Bury would, after allowing increased wages to the men (say, 6s. per shift for stoking and firemen, and the same proportionate increase to coke men, and exhauster and boiler men), amount to 9·64d. per ton, against Mr. Goodson's cost of 9·75d. at Heckmondwike.

Apart from the two points of getting the coals from the stores into the retort-house and working two shifts in 24 hours, which, if carefully analyzed, will show that the working at Bury is more economical than that at Heckmondwike, there is also the question of efficiency to be taken into account.

I find from another statement that Mr. Goodson made, and which appeared in the "JOURNAL" for Dec. 17, 1901 (p. 1599), that his cost for working at that time was 11·53d. per ton of coal carbonized, and 1·18d. per 1000 cubic feet of gas made. Therefore, from these figures, he shows a make of gas at the rate of 9770 cubic feet per ton of coal carbonized (which appears to me to be a very low make per ton from the coal in that district); whereas the make at Bury is 10,900 cubic feet per ton of coal carbonized.

Manchester, Jan. 8, 1903. JOHN WEST.

Use of Gas for Warming Enclosed Spaces.

SIR,—I do not think Dr. Birchmore's remarks call for any further reply; but he is evidently mistaken on two points. I did not consider it necessary to explain, as regards the different heating power of gas, that we had to deal with oil gas of 60-candle power, air, gasoline, and coal gas, varying in different towns from 14-candle power in London to 32-candle power in some parts of Scotland. His remarks as to the capabilities of the British gas engineer are uncalled for and out of place. The other point where he makes a mistake is in stating that I am "a maker of gas-stoves with flues"—a statement which is true in a very limited sense, as the most cursory examination of our lists would show.

Warrington, Jan. 7, 1903. THOS. FLETCHER.

Notable Experiences with Blue Water Gas at Ilford.

SIR,—Though I do not propose to enter into any discussion with Mr. Westcott on the relative merits of the water-gas processes in which he and I are commercially interested, I think it is only fair to point out an inconsistency in his letter published in your issue of the 6th inst.

Mr. Westcott says that for some years past the same amount of water gas has been produced per ton of coke with the "Economical" type of generator as is obtained by Mr. Brown with the Dellwik water gas generator at Ilford. He, however, omits to mention that the gas produced with the "Economical" type of generator is carburetted water gas, which contains at least 25 to 30 per cent. of oil gas. Deducting this oil gas, his maximum yield of blue water gas is, therefore, 53,000 to 56,000 cubic feet per ton, as against the 75,800 cubic feet obtained by Mr. Brown.

Carburetted water gas, produced with the ordinary form of generator, costs from 14d. to 18d. or more per 1000 cubic feet. It is difficult to

comprehend on what grounds Mr. Westcott expects that the admixture of such gas with coal gas should prove cheaper than a similar mixture containing water gas costing 3½d. The rational utilization of blue water gas in conjunction with coal gas manufacture in the manner done at Ilford, or on the lines proposed by Professor Lewes, is of such importance to the gas industry, that Mr. Brown's valuable contribution to the subject cannot fail to meet with the greatest interest.

C. DELLWIK.

25, *Victoria Street, .W., Jan.* 10, 1903.

Testing of Low-Quality Gas.

SIR,—Knowing something of this subject, I should like to observe that the adoption of a 3½-inch flame as a standard for testing would be most unscientific, and any length of flame that might prove satisfactory at one place would not be found of the same value at another, where the methods of carbonizing are different. A standard flame-length would lead to far greater disappointment than the present method of flame value. I am strongly in favour of burning the gas at such a rate as shall yield a light equal to a definite number of candles in a burner suitable to the full development of the illuminating power of the gas. The method and tests given by Mr. Sheard in his article in the last number of the "JOURNAL" (p. 28) are certainly unreliable from his own showing. For instance, the second test, on the 16-candle basis, is 13·91. In round figures, this is 14 candles; but by consuming more gas in the chimney a gain of 0·8 candle is found. This is what one would have expected, but certainly not the same with 15·38 and 16·33 candle gas, particularly with the 16·3-candle gas; yet the increase in lighting value in all cases is 0·82, 0·84, and 0·90 candle respectively. Now, 16·5-candle gas only shows 0·2 candle gain by the consumption of a greater volume of gas. Surely such results, on the face of them, cannot be right. I think, however, this may be due to the fact that the tests have not been corrected for temperature and barometric pressure, but simply for volume of gas to 5 cubic feet per hour.

W. GRAFTON.

East Ham, Jan. 8, 1903.

Gas Consumers and Meter-Rentals at Tipton.

SIR,—I notice in the last number of the "JOURNAL" a report to the effect that the Tipton District Council have decided to charge a meter-rental on slot meters where the gas consumed does not reach 5s. per quarter. I shall be much obliged if you will correct this statement. We do not charge a meter-rental to slot-meter consumers, and have no intention of doing so. If we find the meter has not been used, or only so very occasionally that the account does not pay us, we remove it and the fittings. If the consumers want it for occasional use, they must purchase the fittings and pay meter-rental; but this is a very rare state of affairs. In the case of ordinary consumers, we have decided to charge a rental of 1s. per quarter on the meter when the accounts do not reach 5s. per quarter in the summer quarters, and 3s. 6d. in the winter (two) quarters.

SIDNEY O. STEPHENSON,
Engineer and Manager.

Tipton, Jan. 9, 1903.

Incandescent Gas-Burners.

SIR,—Mr. Carpenter, in his letter printed by you on the 6th inst., does not quite do justice to our enterprise. I would remind Mr. Carpenter that the household types (Nos. 2 and 3) of Welsbach-Kern burners have for some considerable time now been catalogued and issued with the special sized globe carriers referred to by him, or with globe carriers of the standard Welsbach "C" fitting, at the option of the customer, and without extra charge.

LCE. FLETCHER,
General Manager, Welsbach Incandescent Gaslight Company, Ltd.

78, *York Street, S.W., Jan.* 10., 1903.

LEGAL INTELLIGENCE.

SANDWICH QUARTER SESSIONS.—Friday, Jan. 9.

(*Before Mr.* M. J. MUIR MACKENZIE, *the Recorder.*)

The Charge of Damaging Gas-Meters at Ramsgate.

This was an appeal entered by Thomas Leggett, an engineer, of Ramsgate, against a conviction by the Borough Magistrates on a charge of having caused damage to certain gas-meters, the property of the Ramsgate Corporation.* On Dec. 6, complaints were received that something had gone wrong with the gas in the St. Luke's district. When the workmen went to the place, they discovered that a large quantity of water had found its way into the mains. Eventually, the area of search was narrowed until suspicion fell upon a house called "Cotswold," on the Dane Park Estate, which for a considerable time had been shut up. The premises were locked; and a bill appeared in the window stating that Leggett was the agent for the house. Application was made to the owners of the premises for permission to enter the house, and subsequently this was done. Upon inspecting one of the water-closets, evidence was found that a piece of piping had been fixed from the water supply-pipe and carried through the doorway to the gas-pipe outside. This piping had apparently been supported on a nail driven in the wall above the doorway. By this means, 400 or 500 gallons of water had found its way into the gas-mains. Leggett had previously been convicted of infringing the building bye-laws; and words made use of in a conversation he had with a member of the Town Council, it was contended, showed that he entertained in consequence a feeling of spite towards the Corporation officials. The Magistrates fined the defendant the maximum amount of £5, and ordered him to make good the £50 worth of damage done and pay £1 2s. 6d. costs.

Mr. F. M. ABRAHAM and Mr. C. M. PITMAN appeared for the appellant; Mr. G. THORN DRURY represented the respondent—Mr. T. N. Ritson, the Engineer to the Ramsgate Corporation Gas and Water Departments.

Mr. THORN DRURY, in opening the case on behalf of the respondent, narrated the facts (which were fully reported in the "JOURNAL" at the time of the first hearing). He remarked that motive was always important; but it became ten thousand times more important when one could prove an expression of intention. The appellant had the motive, the skill, and the opportunity to do the mischief; and if it was held that he was not the person responsible, then they had to assume the existence of some other individual possessing the motive for bringing the Corporation into discredit, the skill necessary to effect the mischief, and the right to enter the house, where the connection between the gas and water mains was made.

Mr. *F. A. Coleman*, chief inspector of gas and water fittings to the Corporation, repeated the evidence he gave before the Magistrates. He said he could not suggest any way other than that alleged in which the water could get into the gas-mains. Water could only find its way into the gas-mains, in the quantity stated, by a simultaneous breaking of gas and water pipes in close proximity. No such breakage had occurred. On Dec. 15, witness went to "Cotswold," and saw the appellant outside some houses near "Danecote." Appellant did not speak to witness. In the house, witness found a pair of steps, in a cupboard under the stairs. The steps were there on Dec. 19, but disappeared on the 23rd; the appellant stating that he had taken them away as he wanted them for a job.

In cross-examination by Mr. ABRAHAM, witness said he did not consider it extraordinary that he should have seen the appellant in the locality, as he was the agent for the houses. More than 500 gallons of water had entered the gas-main. Witness had heard of complaints the appellant had made to the Chief Constable, as to damage having been committed at "Cotswold." The work alleged to have been done in the water-closet was not necessarily a two-handed job. Witness broke into the premises three times, and went there because he had to act upon instructions.

James Perriman, an employee in the Gas Department, said he put a barrow upon the appellant's premises, about the beginning of October. Appellant wanted £2 10s. before he would let it go. Afterwards, Leggett saw witness, and said: "Do not think I meant you any harm; but, by God, it's them officials."

Cross-examined: He did not mention that, at the former hearing. He had told Mr. Coleman of the matter. Appellant had complained that Corporation officials had thrown rubbish on his land. When he found witness would have to pay for the barrow, he gave it up.

Mr. *Henry Hinds*, F.S.I., said he went to "Cotswold" recently by appointment, to meet the respondent, the appellant, and certain officials. He formed the impression that the pipe unions had recently been disturbed. In the syphon outside there was 12 inches of water. Witness took the levels of the various roads in the vicinity with the Borough Engineer. After they had done this and opened the pipes, he came to the conclusion that he could not suggest any other house whence the water could have come. He was present when deposits were taken from mains at points marked on the plan handed in. The deposit taken from the main leading directly to "Cotswold" was wet. That taken close by "Cotswold" was dry. It was not, witness should say, possible for anyone outside to see what was going on inside the house.

Cross-examined: He noticed the unions; and his impression was that there had been recent disturbance.

Arthur W. Larkin, a registered master plumber, gave evidence that he visited "Cotswold" on Dec. 19, and examined the unions. He saw marks indicating that they had recently been removed; and on the floor underneath the gas-tap there were signs of water having dripped. The unions leaked slightly.

Cross-examined: There was about the house the usual amount of dirt one would expect to find in an empty house.

Mr. *T. G. Taylor*, Borough Surveyor and Engineer, who attended at "Cotswold" with Mr. Hinds and others, said he believed the unions had recently been disturbed. He had taken the levels in the neighbourhood; and he could not imagine how water could have found its way into the gas-mains except from "Cotswold." The suggestion that the water in the syphon was due to condensation was, in his opinion, ridiculous.

Mr. *T. N. Ritson*, corroborated the evidence given by the previous witnesses. He said that the water in the mains must have come from "Cotswold."

Cross-examined: He was the nominal prosecutor. He knew that a second summons had been taken out and subsequently withdrawn at the Police Court.

Mr. *J. W. Woodhall*, builder and contractor, and a member of the Ramsgate Town Council, repeated his evidence as to the interview with the appellant at his office, after Leggett had been fined for a breach of the building bye-laws.

Cross-examined: He did not ask the appellant what he had up his sleeve. Witness was friendly with him so far as business matters were concerned. He did not attach much importance to the conversation at the time. On several occasions the appellant, referring to the municipal elections, had said he had "surprises" to come.

Mr. ABRAHAM said that if his client had committed the act alleged, he would be fit only for a lunatic asylum.

Appellant was then called, and stated that the last work he did at "Cotswold" was on Nov. 25, when he put in a square of glass that had been broken. In March last, he was passing the house, and noticed that the overflow from the flushing-tank was dripping. He put it right,

* See "JOURNAL," Vol. LXXX., p. 1699.

and had not touched the tank or connection since. On Nov. 26 he reported to the Chief Constable that a window at "Cotswold" had been broken, and that a fence had been damaged. He did not go to "Cotswold" between the 1st and the 6th of December. He had the salammoniac, the solder, &c., which were found there for work he had previously done on the premises. He did not know the steps were there. On Dec. 19, he went and examined the premises. He did not know how the gas-tap was left. The nuts did not bear signs of having been recently tampered with. He had never conceived the idea of turning the water into the gas-main. All he told Mr. Woodhall was that the members of the Council would have to come out next November, and that they would be given "a warm time."

The RECORDER asked witness a number of questions regarding the work upon which he was engaged between the 1st and the 6th of December.

In cross-examination by Mr. THORN DRURY, witness said the conversation with Mr. Woodhall was a political one. He was talking about the elections, and he thought Mr. Woodhall understood that. He did not say he would make the Corporation pay dearly; and he could not remember saying that he had "something up his sleeve." He could not swear as to what was said. He denied that he used the remark attributed to him by the witness Perriman. He suggested that someone had connected the gas and water pipes underground. He believed it was an accident, and that someone in Ramsgate knew that he was an innocent man.

Mrs. *Leggett* said the key of "Cotswold" was kept in her custody. During the first week of December it was never taken from her house, not even by her husband.

Charles Hope, an employee of the appellant, said he assisted him to take a pair of steps to "Cotswold" after the date of the prosecution.

James Assiter, a plumber, said that it was impossible for the mischief to have been done in the way suggested. The nail over the door, which was said to have supported the pipe, would not have borne a pound weight. The dust upon the nail showed that no string had been put upon it recently.

Edward Brown, a registered plumber, said that on Dec. 19 he examined the gas-tap and unions. The unions did not appear to have been turned for some months. There was whitewash on the gas-tap. He did not think it possible that the water could have got into the mains in the manner argued by the prosecution.

Cross-examined: He could not suggest any other way in which the water could have found its way there.

Mr. ABRAHAM then addressed the Recorder for the appellant, urging that if there was any doubt in this case he was entitled to the benefit of it. It was extremely unlikely that a man who was about to commit the diabolical act attributed to the appellant would have made a point of going to the police and asking the Chief Constable to give the house special supervision a few days before the commission of the alleged offence. The most probable solution of the matter was that suggested by the appellant himself—viz., that someone in Ramsgate (a workman or other person) had accidentally caused the water to flow into the gas-mains, and was afraid to come forward and say what he had done.

The RECORDER, in giving his decision, referred to the difficult and extremely distasteful duty it was to him to be obliged to give judgment in a matter of this kind without the assistance of a jury. He had heard and fully considered the evidence on both sides; and he thought that the witnesses for the respondent had given their evidence in a perfectly satisfactory manner. He was satisfied that the water got into the gas-mains from the house "Cotswold;" and he was further satisfied that the appellant was the only person who had access to the house. He had narrowly and carefully watched the manner in which the appellant had given his answers; and he was not favourably impressed with the hesitating way in which he had replied in his cross-examination regarding the conversation with Mr. Woodhall. The conviction would be affirmed; and the appellant would have to pay the costs.

The parties agreed to the costs being assessed by the Recorder; and he fixed the amount at £50.

Charge of Stealing Gas.

At the Worship Street Police Court, a few days ago, a cycle maker and repairer named Thomas Hudson, of Bishop's Road, Bethnal Green, was committed for trial on a charge of stealing 12,600 cubic feet of gas from the Gaslight and Coke Company. Suspicions were aroused by the smallness of Hudson's gas bills, and an examination led to the usual discovery—that the inlet-pipe had been tapped by means of an india-rubber tube, and a supply of gas surreptitiously obtained. The accused admitted to an official of the Company that the thefts had been going on for six months.

Gas Company Fined for Damage to a Road.

At the Pontardawe Petty Sessions, Dr. G. Griffiths, as Chairman of the Bryncelyn Gas Company, and Isaac Jones, a foreman gas-fitter employed by the Company, were summoned for unlawfully damaging the highway between Pontardawe and Neath. It appeared that the Company had complained that the Council's steam-rollers had damaged the gas-mains which were laid under the surface between the canal bridge at Pontardawe and Alltwen; and, without obtaining the requisite permission, they had been for three weeks engaged in removing the pipes from one side of the road to the other—the damage done being estimated at £10. The proper course to have pursued was, before proceeding with work of this description, to inform the County Surveyor, and deposit a sum of money with the County Treasurer as a guarantee that the road would be properly repaired when the work was completed. Mr. Lloyd Edwards, the Surveyor, said he doubted whether £10 would cover the damage done to the road. For the defence, it was submitted that the road was in exactly the same condition now as formerly. The Bench imposed a fine of £3 inclusive, and ordered the payment of £10 by the Company, to make good the damage done to the road.

MISCELLANEOUS NEWS.

WELCOME HOME TO LEICESTER CORPORATION RESERVISTS.

Dinner to Employees in the Gas and Electric Lighting Department.

The King's Hall of the Grand Hotel, Leicester, was the scene of an exceptionally interesting gathering on Monday evening last week, on the occasion of the dinner given to the South African contingent connected with the Gas and Electric Lighting Department of the Corporation. There were 320 employees present, including 69 men who were called out in connection with the hostilities in South Africa. Altogether, 62 men left England, and 17 were called upon for garrison duty. There was not a single death among them; and, as a consequence, 69 out of the 79 were able to be present at the dinner—the remaining 10 having either enlisted again or returned to South Africa. The gathering was arranged by the staff and men at the works, with Mr. W. S. Lovell as the Secretary, while the Gas and Electric Lighting Committee entered into the proceedings with the greatest zest. Many of the guests appeared in their khaki uniforms. Mr. E. Edwards, the Chairman of the Committee, presided; and among those present were the Mayor (Alderman W. W. Vincent), the ex-Mayor (Alderman E. Wood), Mr. Alfred Colson, M.Inst.C.E., the Gas and Electric Lighting Engineer to the Corporation, and his son, Lieut. D. F. Colson.

The toast of "The King" having been duly honoured, the Chairman proposed "Our Guests." He said it was a very happy thought on the part of the employees to invite their comrades to that gathering, and to publicly welcome them on their return from South Africa. Three years ago there were trouble and distress in the land. They read of many checks to British arms, and were humiliated from time to time to hear that British soldiers had been taken prisoners by the Boers. They began to wonder if British arms had lost the art of war; and they were not assured until they heard the call to arms extended to the reservists and the volunteers. They found thousands of men followed the standard and went to South Africa to help fight their country's battles. Leicester did its duty, and the men of the Corporation Gas and Electric Lighting Department, he thought, did even more than that. Those who went out were distributed among 27 regiments at the seat of war, some of them being connected with the Infantry of the Line, the Cavalry, the Artillery, the Engineers, and the Ambulance Corps. The Gas and Electric Lighting Department volunteers and reservists were represented in many of the important battles, and took part in the long marches which General Hamilton led across the Transvaal. Though many of the men were wounded, taken prisoners, or stricken down with fever, every man, he was pleased to say, lived to come home again. More than that, every man came back, and had the privilege and opportunity of taking up the position he left when he went out to the war. Personally, he thought the experience of the men connected with the department who went to the front was unique in the history of the campaign, and deserved to be recognized. He felt sure the men did their duty, and did it well. The workmen of the Gas and Electric Lighting Department were as fine a body of men as was to be found in England; and the men who went to the war were the pick of them. Such men could do no other than carry out their duty; and now they had returned, he was sure all hoped they would fight the battle of life, and live manfully and long to enjoy the blessings of peace. He was pleased on behalf of the Mayor of the town, the Deputy-Mayor, the Committee, and their fellow-workers, to extend to them a hearty and sincere welcome home again. He was pleased that while the men were away in South Africa, they had very few anxieties about their homes, for they knew their wives and families were being provided for by the Committee under whom they worked. He found that the Committee paid to the wives and families of the men who were at the front the sum of £2974 to provide them with the necessaries of life. Not only did they do this, but they also took care that their work was reserved for them. He wished the example of the Leicester Corporation could have been followed by all other public bodies and employers of labour, so that some of the men who had served their King and country might have been relieved of the anxiety of not knowing what to do to provide their daily bread. The toast was most enthusiastically received.

The name of Lieutenant Colson having been coupled with the toast, he responded to it first. He acknowledged the honour conferred upon the contingent in being entertained at that gathering, and went on to say that many of those who went out to the war little thought that that banquet would be the end of it. He also wished to pay a tribute to the generous treatment extended towards the wives and children of the men, and to express his appreciation of the efforts put forward in connection with the soldiers' fund. He thought they might be pardoned if they felt some pride at the way in which the Gas and Electric Lighting Department had been represented in a far distant country during a serious crisis. At Colenso, Spion Kop—in fact, in all the fighting leading up to Ladysmith, as well as in the town itself, men of the department were present, while they also took part in the engagements at Graspan, Belmont, Modder River, Magersfontein, Paardeberg, and Sanna's Post. There were some who joined in the march to Bloemfontein and Pretoria; others had been prostrated by enteric fever and other diseases, or had fought in many a battle; but he was glad to say they had all been able to return to Leicester. Other members of the contingent followed, and related their experiences. Mr. A. G. Hales, a war correspondent, also spoke in acknowledgment of the toast. He referred in terms of praise to the efforts of those at home in the interest of the wives and families of the men engaged in South Africa during the war, and remarked that when a man knew his wife and child or children were carefully looked after, it made him ten times as good a man on the field of battle.

The toast of "His Worship the Mayor" was next submitted by

Alderman Wood, who congratulated the men on their safe return, and expressed his admiration of their comrades who had inaugurated that banquet in their honour. The Mayor, in reply, said how gratified he was that the Corporation employees had so worthily maintained the honour of the town. He was specially pleased with the patriotism exhibited by their comrades in inaugurating the gathering that evening, and with the way in which they had discharged their duty in assisting the wives and families of those who went out to the war. Mr. Jennings proposed "The Chairman of the Gas and Electric Lighting Committee," to which Mr. Edwards responded. He said he was proud to preside over the best Committee of the Corporation, and desired to acknowledge the splendid work of Mr. Colson. There was no better man at the head of any gas-works in England; and he (the speaker) was confident that while he was at the head of the department it would go on as well in the future as it had done in the past. Mr. Colson, in acknowledging the toast, remarked that if the men who went to South Africa had done their duty, so, too, had those at home. He did not believe there was any other gas committee in England who had done the same as the Leicester Corporation Gas Committee in assisting the wives and families of the men who went out to the war.

An interesting incident of the evening was the sending of a telegram to His Majesty the King, during the progress of the dinner, expressing continued loyalty and devotion to the Crown, and the earnest hope that the present reign might be long, peaceful, and happy. His Majesty's thanks were received in a telegram from Lord Knollys.

DEVONPORT GAS AND ELECTRICITY SUPPLY.

Lighting of Government Establishments—Proposed Extension of the Gas-Works.

At the Meeting of the Devonport Town Council last Thursday—the MAYOR (Mr. J. C. Tozer) in the chair—considerable discussion took place with reference to the gas and electricity works.

The minutes of the Electricity Committee were first presented, and led to a question as to the supply of current to the Dockyard and other Government establishments. The speaker said he had been told that the Government were preparing plans for the erection of a generating station of their own, and he wished to know what steps had been taken, and whether any influence had been brought to bear to prevail on them to take current from the Corporation.

Mr. G. H. SMITH, junr., the Chairman of the Committee, said that, although he did not know definitely what the intention of the Admiralty was, he understood they were going to have a generating station of their own in the Dockyard, and the Committee believed they had nothing to fear on that score. With regard to other naval establishments—the Naval Hospital, the Ordnance Department, and the Victualling Yard—he hoped the current for lighting these places would be obtained from the Corporation. Application had also been made for a supply, which they hoped might be permanent, of current to the Royal Naval Engineering College. They did not hope to obtain the right to supply the whole of the Government establishments.

Mr. MARTYN (who put the question) said he had understood that when the Council were asked to approve of additional capital expenditure by both the Electricity Committee and the Gas Committee, it was in order that they would be able to supply any amount of gas or electricity that might be required. He should move that the minutes be referred back to the Committee, unless they had the definite assurance that, before it was settled that any part of their establishments should be supplied by the Government, the whole influence of the Corporation should be exercised to induce them to reconsider the matter.

Mr. SMITH replied that the Committee had been most anxious to supply everyone as far as possible; and as the demand had increased, they had asked for more money to develop the undertaking. They would still do what they could in regard to the Government's requirements; but as to the Dockyard, there had been no negotiations, and they heard that a scheme was in preparation which would involve the expenditure of a million of money.

After some further remarks, the proposal to refer the minutes back to the Committee was rejected.

The Gas Committee, whose recommendations on the subject of the extension of the gas-works were referred back for further consideration, now reported that, having once more considered, at the request of the Council, their decision to carry out the entire scheme of extension and improvement recommended by the Consulting Engineers (Messrs. Stevenson and Burstal), and the latter having assured the Committee that no modification or postponement of the scheme, or any part of it, was practicable without detriment to the public interest, it was resolved that the resolution to proceed with the whole scheme be confirmed.

Mr. W. HORNBROOK, in moving the adoption of the report, said that when the matter last came before the Council there was a suggestion that the Committee were endeavouring to rush it through the Council. In order that there should be no such impression, the Committee consented to the matter being referred back for further consideration. The result was that they returned with a stronger recommendation than in the first instance. They must be guided to a large extent by their Engineers. After the calculations which these gentlemen had made, it was certain that the Council must extend the gas works. Had the Company remained in possession, they would have had to do very much what was now proposed. In two or three years they would fail to supply the demand for gas, if they did not proceed. The consumption was increasing throughout the year by more than 11 per cent., with every probability of its continuation for a considerable time, and they were putting forth every effort to produce what they could. But if the increased demand went on, they would be utterly powerless to meet it. In order to carry out the principal part of the works later, it was necessary to get the small gasholder out of the way; and they must erect a new one forthwith so that this might be done. The works would take from two to three years to complete.

Mr. R. H. RENDLE said that on the last occasion he opposed the spending of £83,000 on the extension of the gas-works, and he still thought that, having regard to the probability of their losing a large customer in the Admiralty, they ought to be very careful not to overload the undertaking with capital expenditure. He wished to proceed in a safe way, and therefore he should move, as an addition to the Gas Committee's minute, that the scheme be proceeded with as the Committee recommended from time to time.

The TOWN CLERK thought the meaning of the amendment ought to be made clear. He did not know whether it was to be regarded as a direct instruction to the Gas Committee that the work was not to be done under one contract, but spread over a series of years. At the last meeting of the Committee, he asked the Consulting Engineer whether it was practicable to divide the work over several contracts extending over a series of years, and he said it was not.

Alderman J. B. JAMES said there was a very general feeling in the Council that to enter upon an expenditure of £83,000 at this juncture was to go faster than they ought. Could not the work be carried out in sections, so as ultimately to complete it without over-capitalizing the undertaking?

Mr. H. BANBURY was of opinion that the amendment would meet the case, and enable them to decide from time to time whether the extensions were necessary. The capital of the Plymouth Gas Company expended up to March, 1901, was £324,188; while that of the Devonport gas undertaking, including the £83,000 which the Committee proposed to lay out, would be £250,000. The Plymouth Company, however, had an output of 1000 million cubic feet per annum; and the capital was £324 per million cubic feet. Taking the make at Devonport at the actual figure of 276 millions last year, they would have a capital expenditure equal to £900 per million cubic feet. They were told how expensive the production of gas was at Devonport; and he asked the Council to consider whether they ought to incur an outlay which would treble the capital per million cubic feet of output as compared with Plymouth. He feared the expenditure would be much more than the estimate. The Gas Company went in for new purifiers at a cost of £5000; but directly the Corporation got the works they increased the size of the purifiers, and the cost, instead of being £5000, rose to £10,500.

Mr. SMITH, jun., said the whole matter hinged on whether or not it was costing a great deal more to produce gas than it ought to cost. Messrs. Stevenson and Burstal stated in their report that the cost of production was 9½d. per 1000 cubic feet, whereas if the works were brought up to date in every respect it should not be more than 3d. It was this that made the Gas Committee agree to the scheme, which should be carried out as soon as possible in order that the ratepayers might benefit by it.

Mr. E. H. STEVENSON, who addressed the meeting at the request of the Mayor, explained, as to the extra cost of the purifiers, that they were increased by one-fifth in area by his advice. The extra outlay included also a considerable portion of the cost of the building, the whole of the floor above the purifiers where the oxide was revivified, and a considerable amount of labour-saving machinery for shifting the oxide. Even at the increased cost, it was a very reasonable contract. With reference to the carrying out of the work in sections, he did not quite understand the Town Clerk's remark at the last meeting of the Committee. He thought he asked whether the work could not be done in sections of smaller works. If he had understood the question to be whether the work could be carried out under several contracts spread over a series of years, he would have replied that he thought the work should be carried out in a large number of contracts. The work ought to be carried out so that it should be ready, if possible, for the winter of 1904, or certainly 1905. The last year in which the Company had the works they sold 225 million cubic feet; and in this financial year the Corporation would sell, as nearly as he could calculate, 276 millions. The increase, therefore, was very rapid. The consumption of the Admiralty was simply the quantity of gas which was the annual increment to the undertaking. If they lost the Admiralty now, they would overtake in the following year what they had given up. The first portion of the works they must undertake was the gasholder. Then he would suggest that they should go on with the rest of the works; and the sooner they did it the better, because the whole of the profits of a gas undertaking were made in the retort-house. With the works as they were, they would never make profits; they would never pay interest and sinking fund until they reconstructed them. At present the Corporation were wasting 6d. or 7d., if not 8d., per 1000 cubic feet because of the bad state of their works; and as every 1d. per 1000 feet meant over £1100, they could easily calculate how many times £1100 per annum they were losing. It was something between £7000 and £9000 a year they were actually throwing into the sea.

Alderman S. D. BROOMING asked if Mr. Stevenson could give them any guarantee that the reduction in the cost of manufacture from 9½d. to 3d. was likely to take place.

Mr. STEVENSON replied that he would guarantee it. Gas was being made at Heckmondwike, for all labour in the retort-house, at 1d. per 1000 cubic feet. Plymouth, with a mixture of old and new works, was spending not more than 1·75d. per 1000 cubic feet for repairs and maintenance of works. If they put these two figures together—and he did not know why they should exceed them—they had a cost of only 2¾d., and he had allowed 3d. The present cost of 9½d. was from the Corporation's own books.

Mr. FREDMAN asked how the Company managed to pay their dividend, if the works were in such an awful state.

Mr. STEVENSON said that at the arbitration he stated that the works were the worst he had ever seen. Compensation was paid to the Company really upon the value of their concession and their pipes. His own belief was that the Umpire gave little or nothing for the works. If these had been in proper order, the Company would have received another £20,000 or £25,000, if they might judge what had been given for other gas undertakings. Even after spending the proposed £83,000, the Corporation would get the works for 25 per cent. less per million cubic feet than any modern arbitration had given for gas-works they had purchased

The Committee's recommendation, with the addition suggested by Mr. Rendle, was carried.

GAS-METER TESTING IN MANCHESTER.

Report by the City Justices.

The Committee of the Manchester City Justices who supervise the testing of gas-meters have issued the following report: "Your Committee beg to report that the subject of gas-meter testing, as prescribed by the Sale of Gas Act, 1859, has occupied their attention for several years. In 1894, the Committee communicated with the Standard Department of the Board of Trade, suggesting that certain additional tests should be applied to ensure accuracy to both the measuring and registering portions of gas-meters. In reply, the Superintendent of the Weights and Measures Department of the Board pointed out that it would be necessary for the Sale of Gas Act to be amended before the suggested tests could come under it. The Gas Committee of the Manchester Corporation were afterwards approached with a view of arriving at some agreement whereby all Corporation gas-meters could be tested by the index in addition to the test specified by the Sale of Gas Act, 1859. After due consideration, the Corporation Gas Committee adopted the suggestions of the Gas-Meter Testing Committee, and also decided that the additional testing fees incurred should be paid by the Corporation. In consequence of the want of working space in this department, the Fire Brigade Sub-Committee transferred certain premises adjoining our present offices in Bootle Street, which necessitated some structural alterations, These having been completed, the double test was commenced on the 1st of July last, and has since been continued in a very satisfactory manner. Notwithstanding that the meter makers were informed in April last that all Corporation meters would be subjected to the double test on and after July 1, in less than three months from the commencement of the test two meters were discovered to have incorrect indices attached, and were both found to register 50 cubic feet in error for every 100 cubic feet of gas consumed. These meters would most certainly have been passed and stamped as correct before the double test came into force; proving that this precautionary test was and is necessary. . . . Your Committee record with pleasure that the work of the department has been carried out satisfactorily throughout the year." Appended to the report is a table showing that 37,264 meters were tested in the twelve months, and that the fees charged amounted to £1235 6s. 3d. In the previous year, 35,909 meters were tested, and the fees charged came to £1132 8s. There was therefore an increase of 1355 in the number of meters tested, and an increase of £102 18s. 3d. in the receipts.

HALIFAX GAS-WORKS EXTENSIONS.

New Coal-Stores.

At the Meeting of the Halifax Town Council last Wednesday, the Gas Committee recommended that a plan prepared by the Gas Engineer and Manager (Mr. T. Holgate, M.Inst.C.E.) for the erection of coal-stores should be adopted, and tenders obtained for carrying out the work. On the motion to receive the minutes, Mr. J. Parker asked the Chairman of the Committee (Mr. Wadsworth) whether the Borough Engineer and Surveyor (Mr. J. Lord, Assoc.M.Inst.C.E.) had been called in in consultation; and he received a negative reply. He then moved, as an amendment, that the minute be referred back, and that Mr. Lord should be instructed to examine the scheme and report as to the cost. He said he did not believe, as a general principle, in calling an official of one department into another. However, the building of a retort-house or a bridge, or the construction of a siding, where a retaining wall had to be put up, as in the case before them, was work which legitimately belonged to the Borough Engineer. It was part of his work, and not part of the Gas Manager's, which was to make gas, and deal with the residual products. There should be no professional jealousy whatever in the calling in of another official who was specially engaged to deal with work of this character. Mr. A. Taylor, in seconding the proposal, remarked that, even if jealousy did exist between departments, the Council had to take a higher standpoint. They had to recognize that the man who was best fitted to do the work ought to be called in Here it was a question of structural work; and the Borough Engineer, he submitted, was the proper official to advise them on a matter of this kind. Alderman G. H. Smith agreed that they ought to get the best advice in architectural matters; and he suggested that Mr. Parker should alter his amendment to the effect that the advice of a professional architect should be sought. Mr. Parker said he could not accept the suggestion, for the reason that the coal-stores were not buildings in the strict sense of the term, but rails on a retaining wall. The Borough Engineer had carried out considerable work of this character; and therefore he was the man to do the work. Mr. Hartley remarked that even if Mr. Lord were called in, he would sanction the plans already prepared for the work, as no other scheme could be introduced. As to Mr. Holgate not being a builder and contractor, the general opinion was that he had already provided them with works of a most substantial character; though, unfortunately, they had been costly through the policy pursued by the Corporation. He claimed that, if they had been carried out by contract, they would have been erected for less money than they had cost. The works now in question were to carried out by contract; he could not see what advantage would be gained by employing the Borough Engineer on gas-works already partly constructed. After some further remarks, Mr. Parker replied. He denied that the work had been commenced. How could it have been, when they were now proposing to invite tenders for it? Regarding day work, the last job that the Borough Engineer undertook on this system was one where the lowest tender was £900, and he had completed the work for £137 less than that sum. There they had a justification for day labour. He asked the Chairman of the Gas Committee to tell the Council whether work for which tenders were to be asked had been done? Mr. Wadsworth replied that it would be absurd to ask for tenders for work that had already been carried out. The recommendation of the Committee was adopted by a large majority. So far, however, as he was concerned, he had no feeling in the matter, except that he wanted to do what was best. Mr. Hartley was right in a sense, One wall had been built, but another wall, to which it would be connected by beams for the accommodation of the rails, had not been put up. The wall completed was proceeded with to find work for men who otherwise would have been out of employment. Whatever the Council decided upon would be right to himself. The amendment was adopted by a large majority.

LONGTON GAS AND ELECTRICITY SUPPLY.

In the review of last year's municipal work which recently appeared in the "Staffordshire Sentinel," the continued success of the gas and electricity works of the Longton Corporation, under the management of Mr. W. Langford, was referred to as a pleasing feature. The dual undertaking has again fulfilled the hopes of the Committee, and provided a substantial relief to the rates out of the profits of the year —that is to say, the profits made by the Gas Department. The electric light installation was only opened in October, 1901, and it has yet to feel its way for success. As a matter of fact, there was a loss of about £426 on the first half-year's working; the profit on the output not meeting the charges for sinking fund and interest. However, it promises to be a paying concern. There are about 45 customers taking the current, the plant is working well, and the output is about one-third of the capacity of the installation. In November, 1901, 5724 units were generated at the station compared with 9537 units last November—an increase of 3813 units; and Mr. Langford is simply waiting for customers to convert a small loss into a balance. Bad trade affected the consumption of gas; but a diminished output to manufactories was compensated for by an increase in household use. After balancing expenses for nine months (to be coincident with the borough account) there was a profit of £1428 14s. 1d. to be transferred to the borough fund. The sum of £2000 is estimated as the profits during 1902-3; and it is thought the figure will be realized. The free fitting up of houses, with the prepayment system, has been introduced, and is very popular. The past year was a record one for fixing cooking-stoves. The gas undertaking was in such a flourishing condition early in the year that the Committee felt justified in reducing the price of gas by 6d. per 1000 cubic feet as from March last to parties using it for motive power. This inducement to manufacturers and others had the desired effect—several new customers having been secured.

SHEPSHED DISTRICT COUNCIL AND THE GAS-WORKS.

Proposal to Purchase.

A largely attended Meeting of the property owners and ratepayers of Shepshed was held in the National School on Monday last week, to consider the question of promoting a Bill next session to enable the District Council to purchase the undertaking of the Gas Company. Mr. J. HARRIMAN, the Chairman of the Council, presided.

The CHAIRMAN, in opening the proceedings, briefly explained that when the announcement appeared of the intention of the Gas Company to apply for a Provisional Order to confer upon them increased powers, he took steps to submit to the Council the advisability of obtaining possession of the gas-works. They considered the question, and negotiations were opened with the Company, with the result that reasonable terms of purchase were arrived at. It was proposed that the works should be taken over at a valuation; but to enable them to purchase, the Council would have to promote a Bill. This had been deposited, and they wanted to obtain the sanction of the ratepayers to the course taken.

The Rev. W. H. F. HEPWORTH, speaking in support of the proposal, said it was found that in some places gas works brought in a considerable revenue, especially from residuals; and when he heard of the opportunity to purchase those at Shepshed, he thought it would be for the benefit of the town, if they could obtain them on reasonable terms. There was a suspicion abroad that they were going to pay for them "through the nose;" but he was pleased to hear that such was not likely to be the case, and that the purchase would be a matter of amicable adjustment.

Mr. DUTTON opposed the purchase, which he said would entail an outlay of £10,500. It was said that they could borrow the money at 3½ per cent.; but it was thought by some that they could not get it for less than 3¾ or even 4 per cent. With regard to the Company, at the present time they had a splendid Chairman and an excellent Manager; and he contended that under the Council, owing to the constant change in membership, the works would not be so well conducted as they were now. If he could see a favourable scheme which would benefit Shepshed, he should vote for it; but he could not see a shadow of a chance that this would benefit the parish, because the amount they would have to pay under a valuation would be exorbitant. The more important factories in the town produced their own light, and one of the largest consumers of gas was giving it up and introducing his own plant. The rateable value of Shepshed was £8544. A rate of 1d. in the pound brought in £35 11s. 8d.; and it would take a 7d. rate to pay £250 a year for 40 years if they purchased the gas-works. They had had two 6d. rates for the cemetery, and a 7d. rate on the top of these would be too much. The town had grown, and they wanted it to go on increasing; but to secure this they must not add to the rates.

Mr. HANDS pointed out that Shepshed was a growing place, and ought to provide for some increase in population. The Gas Company were going to Parliament for £10,000, and they proposed to have a maximum charge for their gas of 5s. 6d. per 1000 cubic feet, whereas the Council under their Bill put the maximum at 5s. He hoped the ratepayers would not take a selfish view of their duties to those who

were to come after them. Parliament not only sanctioned but encouraged public authorities to take up gas and water schemes. He thought Mr. Dutton had raised bogies that did not exist.

Mr. DUTTON said he liked to get a profit on any transaction he entered into. If he thought the gas-works would pay in ten years, he would support the proposal.

Mr. GIBBS said that in ordinary circumstances he considered local authorities ought to own gas-works; but he should not think it advisable to buy them at any price that might be named. If he thought the works could be purchased for £8000, he should say they ought to be bought. The present capital was £2800, and there was a sum of £1600 owing to the bank. He estimated that the valuation would come to £13,000. Was there any man who would vote to pay £13,000 for the works? If he thought they could buy them and carry them on at a profit, he would favour the scheme; but it would mean a rate of 7d. in the pound to pay principal and interest.

The CHAIRMAN then moved a formal resolution approving of the promotion of the Bill to enable the Council to purchase, by agreement or compulsorily, "the undertaking, property, rights, powers, and privileges of the Shepshed Gas and Coke Company, Limited, and to supply gas in the district and parish of Garendon, and to borrow money for such purpose," and to apply the rates to the payment of the costs and expenses of such promotion.

The Rev. W. H. F. HEPWORTH expressed his pleasure in seconding the motion.

Several speakers having supported the Council's proposal, an amendment was submitted to the effect that it should not be proceeded with. This, however, was lost, and the resolution was carried.

CURATE AS GAS STOKER.

A very funny story went the rounds of the papers last week about a curate having done a day's work as a gas stoker. It appears that the "hero"—the Rev. W. B. Soole—has for the past few months held the curacy of St. Mary's, Doncaster. In the immediate vicinity of the church are the gas-works, and many of the men employed therein live in the district. It is a very common experience with the clergy, especially in the poorer parishes, that working men are reluctant to go to church and sit by well-dressed people; and arrangements are made—usually by the curate—to meet them in the mission hall for a social chat. This is the case at Doncaster. Mr. Soole has such a meeting after evening service on Sundays; and it is attended by some of the employees at the gas-works. He, however, was desirous of getting them all; and he went round to the works and had a personal interview with them on the matter. Following the example of those who of old were invited to a certain supper, it seems that "they began every one to make excuses"—the chief one being that after the arduous labours of the day they were too tired to attend a meeting in the evening; and they told Mr. Soole plainly that if he worked, which he never did, he would not do so either. In the course of the interview, a challenge was thrown out that if he would do a day's stoking, the men would all go to his meeting. It was never contemplated that the challenge would be accepted; but it was. Accordingly, much to the surprise of everybody, Mr. Soole presented himself at the works at half-past six on Wednesday morning attired in football costume, and bringing with him oranges and tobacco. He was not long in adapting himself to his surroundings. At seven, ten, one, and four o'clock he took his share of the duty, and, it is said, did his work pluckily, manfully, and well. There were those who thought that he would soon have enough of it; but all ideas of the kind were set at rest when, at about one o'clock, the Rev. T. Collett, the Vicar, appeared at the works with the new "hand's" dinner and a further supply of oranges. At the close of his day's work, Mr. Soole received the heartiest good wishes of the workmen. One effect of his presence among them appears to have been a "bye-passing" of the public-houses on the road home. Mr. Soole told an interviewer on Thursday that he felt "a shade tired" at night, but, with the exception of a little stiffness, was no worse for his self-imposed task.

ELECTRIC LIGHTING NOTES.

Good for the Candle Trade.

We learn from the "City Press" that in consequence of the marked increase there has been of late in the number of failures of the electric light in the City, careful people now keep a store of candles in reserve for use when a sudden emergency arises. The street vendors are sufficiently enterprising to be prepared for such a contingency, and a supply of candles forms part of the regular stock-in-trade of not a few of the more enterprising. When the last breakdown occurred, these far-seeing traders reaped a rare harvest. The market price ruled, in fact, at 3d. a candle.

The Lesson of the Fulham Fatality.

Although we have it on the authority of a well-known poet that "East is East and West is West," and that consequently these geographical divisions are not comparable, the remark is scarcely applicable to the Metropolis. In one respect, at all events, East London is like West London, inasmuch as it possesses public baths which are lighted by electricity. The "East London Observer" therefore deemed it advisable to offer, in their issue for the 3rd inst., a few observations on the danger attending this system, accompanied by some appropriate suggestions. So far as the Stepney baths are concerned, they are, we learn, "safely lighted with gas." Not so those for Poplar and Bow; and the writer lays stress upon the responsibility attaching to the managers of these places, to see that there is not even a remote possibility of the current being conveyed from the

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 92.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 15	10½	Alliance & Dublin 10 p.c.	18—19	..	5 10 6
100,000	10	,,	7½	Do. 7 p.c.	12½—13½	..	5 11 1
200,000	5	Nov. 13	6½	Bombay, Ltd. . . .	5¾—6¾	+¼	5 4 0
40,000	5	,,	6½	Do. New, £4 paid	4¼—4¾	+¼	5 9 5
380,000	Stk.	Aug. 14	12	Brentford Consolidated	247—252	..	4 15 3
270,000	,,	,,	9	Do. New . . .	180—185	..	4 17 3
50,000	,,	,,	5	Do. 5 p.c. Pref. .	134—139	..	3 11 11
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb. .	110—113	..	3 10 10
220,000	Stk.	Sept. 11	10⅝	Brighton & Hove Orig.	207—212	..	5 1 5
246,320	,,	,,	7¼	Do. A. Ord. Stk. .	152—157	..	4 18 9
460,000	20	Sept. 26	10	British.	39½—40½	..	4 18 9
50,000	10	Aug. 14	12	Bromley, Ord. 10 p.c. .	—	..	—
82,850	10	,,	9	Do. 7 p.c. % . .	—	..	—
500,000	10	Oct 15	7	Buenos Ayres (New) Ltd.	10½—10⅝	..	6 10 3
250,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	92—94*	..	4 5 1
150,000	20	July 11	8½	Cagliari, Ltd. . . .	23—25	..	6 12 0
100,000	10	Sept. 26	10	Cape Town & Dis., Ltd.	15—16	+½	6 5 0
50,000	50	Nov. 3	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
550,000	Stk.	Oct. 15	12½	Commercial Old Stock	—	..	—
251,875	,,	,,	9⅜	Do. New do. .	—	..	—
271,875	,,	Dec. 11	4⅜	Do. 4½ p.c. Deb.	—	..	—
800,000	Stk.	Dec. 11	8	Continental Union, Ltd.	133—138	..	5 15 11
200,000	,,	,,	7	Do. 7 p.c. Pref.	140—145	..	4 16 7
575,000	Stk.	Aug. 28	5⅜	Crystal Palace Ord. 5 p.c.	117—122	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref. .	120—125	..	4 0 0
106,158	,,	July 11	5	Do. 5 p.c. Deb. Stk.	139—142	..	3 10 5
486,090	10	July 30	10½	European, Ltd. . . .	18—19	..	5 10 6
354,060	10	,,	10⅝	Do. £7 10s. paid	13½—14½	+½	5 8 8
15,243,200	Stk.	Aug. 14	4	Gas-light and Coke	4 p.c. Ord. . .	86—88	+1	4 10 11
					3½ p.c. max. .	86—88	+1	3 19 7
					4 p.c. Con. Pref.	110—112	..	3 11 5
					3 p.c. Con. Deb.	92—94	+1	3 3 10
2,600,000	,,	,,	3½	Hastings & St. L. 3½ p.c.	90—95	..	5 5 3
3,799,735	,,	,,	4	Hongkong & China, Ltd.	14½—15½	..	5 3 3
4,193,975	,,	Dec. 11	3	Imperial Continental .	203—206	+1	4 17 1
232,500	Stk.	Sept. 11	5	Do. 3½ p.c. Deb. Red.	99—101	..	3 9 4
70,000	10	Oct. 30	8	Lea Bridge Ord. 5 p.c.	115—120	..	5 0 0
3,800,000	Stk.	Nov. 13	10	Liverpool United A	224—226	..	4 8 6
473,600	Stk.	Aug. 14	3½	Do. do. B .	165—167	..	4 3 10
158,2 2	Stk.	Aug. 28	6	Do. do. Deb. Stk.	114—116*	..	3 9 0
561,000	Stk.	Aug. 28	10	Malta & Medn., Ltd. .	4—4½	..	5 11 1
718,100	,,	,,	7	Met. of 5 p.c. Deb.	104—108	..	4 12 7
306,083	,,	Dec. 31	4	Melbourne 4½ p.c. Deb.	103—105	..	4 5 9
75,000	5	Dec. 11	5	Monte Video, Ltd. . .	9—10	..	7 0 0
560,000	100	Oct. 1	5	Newc'tle & G'tesh'd Con.	104—105	..	4 5 9
250,000	100	,,	4½	Do. 3½ p.c. Deb.	97—98*	..	3 11 5
541,920	20	Nov. 13	3½	Oriental, Ltd. . . .	140—145	..	5 10 4
1,515,892	Stk.	Aug 8	4½	Ottoman, Ltd. . . .	6½—7	..	5 0 0
346,855	Stk.	Jan. 2	3½				
300,00C	Stk.	Nov. 27	8				
60,000	5	Sept. 26	7				

* Ex. div.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
105,005	Stk.	June 24	5¾	Ply'mth & St'house 5 p.c	125—130	..	4 8 6
851,070	10	Oct. 15	7	River Plate Ord. . .	10¼—10⅜	..	6 10 3
300,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb..	92—94*	..	4 5 1
250,000	10	Sept. 26	8	San Paulo, Ltd.. . .	11⅛—12⅛	..	6 8 0
135,000	Stk.	Sept. 11	10	Sheffield A	236—238	..	4 4 0
209,984	,,	,,	10	Do. B	233—235	−2	4 5 1
523,498	,,	,,	10	Do. C	233—235	..	4 5 1
103,235	Stk.	Sept. 26	5	Shrewsbury Ord. 5 p.c.	113—116	..	4 6 2
6,000,000	Stk.	Aug. 14	5⅜	South Met., 4 p.c. Ord.	121—124	+2	4 6 0
1,700,000	,,	July 11	3	Do. 3 p.c. Deb. . .	93—95	+1	3 3 2
380,940	Stk.	Nov. 13	5	Southampton Ord. . .	103—107	..	4 13 6
87,950	,,	July 11	4	Do. 4 p.c. Deb.	102—105	..	3 16 2
120,000	Stk.	Aug. 28	6	Tottenham and Edmonton	A. 5 p.c.	118—123	..	4 17 7
300,520	,,	,,	4½		B. 3½ p.c.	93—96	..	4 13 9
182,380	10	Dec. 30	5	Tuscan, Ltd.. . . .	8½—9¾*	..	5 5 3
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	94—96*	..	5 4 2
230,000	5	Aug. 14	5½	West Ham, 10 p.c. . .	—	..	—
172,000	10	,,	6½	Do. 7 p.c. . .	—	..	—
				WATER COMPANIES.			
780,662	Stk.	Dec. 30	11⅛	Chelsea, Ord. . .	315—325*	..	3 10 9
150,000	,,	,,	5	Do. 5 p.c. Pref. .	150—155*	..	3 4 6
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	138—143*	..	3 2 11
175,785	,,	Sept. 26	4½	Do. 4½ p.c. Deb. .	140—145	..	3 2 1
1,720,560	Stk.	Oct. 15	8	East London, Ord.. .	230—235	+2½	3 8 1
654,740	,,	Dec. 11	4½	Do. 4½ p.c. Deb. .	142—147	..	3 1 3
1,282,943	,,	,,	3	Do. 3 p.c. Deb. .	97—99	..	3 0 7
700,000	50	Dec. 11	8	Grand Junction	10 p.c. max..	115—120	..	3 6 8
310,000	Stk.	Sept. 26	4		4 p.c. Deb..	125—130	..	3 1 7
708,000	Stk.	Aug. 14	14	Kent	305—315	..	4 8 11
160,000	,,	,,	7	Do. New, 7 p.c. max..	200—210	..	3 6 8
1,043,800	100	Dec. 30	11	Lambeth, 10 p.c. max..	305—315*	..	3 9 10
406,200	100	,,	8½	Do. 7½ p.c. max..	220—230*	..	3 13 11
350,000	Stk.	Sept. 26	4	Do. 4 p.c. Deb..	125—130	..	3 1 7
500,000	100	Aug. 14	12⅝	New River, New Shares	395—405	..	3 3 2
1,000,000	Stk.	July 30	4	Do. 4 p.c. Deb..	125—130	..	3 1 7
902,300	Stk.	Dec. 11	7	South-wark and Vauxhall	Ord. . . .	208—213	+1	3 5 9
126 500	100	,,	7		7½ p.c. max.	200—210	..	3 6 8
489,200	Stk.	,,	5		5 p.c. Pref.	151—154	..	3 4 11
1,019,585	,,	Oct. 15	4		4 p.c. A Deb.	125—130	..	3 1 7
1,155,066	Stk.	Dec. 11	10	West Middlesex. . .	295—305	..	3 5 7
200,000	,,	,,	4½	Do. 4½ p.c. Deb. .	140—145	..	3 2 1
200,000	,,	Sept. 11	3	Do. 3 p.c. Deb. .	97—99	..	3 0 7

* Ex. div.

wires to the water used by the bathers. He points out that with the use of electric light "there is always uncertainty as to what may happen, because control of the current is by no means absolute. Short circuits will occur in a mysterious way, generally resulting in damage from fire, and sometimes with loss of life." He acknowledges that East London has some of the ablest electrical experts, whose devotion to their duty is quite exceptional; but these gentlemen cannot be everywhere, and time is limited. Much of their work has to be delegated to subordinates; and it is here that the difficulty occurs. "Before current is supplied to any premises, the installation has to be inspected; but where the inspecting authority is interested in supplying the current, what happens every day is well known. Of all things in this world, the wiring of premises for electrical purposes demands to be undertaken with the greatest skill, and at the greatest expense. Keen is the competition, prices are cut, and this involves faulty workmanship. Then comes the catastrophe." He goes on to say that if the public will have electric light, they must be prepared to pay, not only its additional cost as compared with gas, but also the cost of that perfect wiring of their premises which alone will ensure ordinary safety. "In East London, the local authorities are trying to make their electric lighting installations pay, and rightly so. But it seems there is a tremendous risk. Cheap work is being put in by consumers, great and small; defective systems are being laid down by unskilled tradesmen; and with the more general use of the current, similar accidents to those at Fulham are rendered more probable." The writer concludes by saying that if electric current be used, there ought to be proper official guarantee that no expense has been spared to protect life and property.

Municipal Electric Light Works and Depreciation.

The report presented by the Finance Committee of the York Corporation at the last meeting of the latter body contained the letter from the Auditor (Mr. H. W. Pulleyn), on the subject of charging depreciation against the revenue account of the electric light undertaking, to which reference was made in the "JOURNAL" last week. It may be remembered that he expressed the opinion that any future balance of profits apparently available for the relief of the rates would be purely fictitious unless the claims of depreciation were recognized. Alderman Rymer, in moving the adoption of the report, said he did not agree with the views of the Auditor. Although the machinery might not hold out 25 years, the buildings would last for a very long time. Alderman Wragge said the machinery would not last anything so long as the period allowed for redemption; and if they had no provision for depreciation, they would have to buy new machinery out of revenue, and not out of capital. He entirely agreed with the Auditor. Alderman Jones pointed out that repairs and renewals were being paid for out of the Electric Light revenue. Mr. H. V. Scott (Chairman of the Finance Committee) contended that the Auditor was mistaken on two points. In the first place, he assumed that the average life of the assets acquired with the money provided by the loans was less than the authorized term for repayment, and that therefore the provision out of revenue for sinking fund instalments to redeem the loans was not of itself sufficient. This was an assumption which was not warranted by facts. The Auditor was not an electrical engineer, a building engineer, or a valuer of property; he was only a person acquainted with the keeping of accounts. He might say that they ought to have a depreciation account; but it was not for him to assume the average life of the assets. At the end of his letter, Mr. Pulleyn said: "Under these circumstances, I feel obliged to point out that any future balance of profits apparently available for the relief of the rates will be purely fictitious unless the claims of depreciation are recognized." This was not the point he was raising in the first part of his letter. He said they ought to start a depreciation account. What was the use of that? It was simply putting figures on a piece of paper. The law was perfectly clear on the matter. They might have a depreciation account; but they could not levy a rate for the purpose. They would have to keep up the account out of revenue, and buy new machinery out of the rates. It was a pure question of book-keeping; and he contended that the Committee's books were kept in accordance with the regulations of the Board of Trade. It was not a new question; it had been considered over and over again. At a meeting of the Institute of Municipal Treasurers and Accountants at Hull last July, there was submitted a report of the Council in which it was stated that a deputation from the Incorporated Municipal Electrical Association had attended in connection therewith on Dec. 7, 1901. With regard to the question of depreciation, the deputation said it was a most intricate subject; but while there was a general feeling that it should not be provided beyond the repayment of loans when an equated period of 25 years was obtained, it was perhaps desirable to establish a reserve fund for contingencies. It was resolved by the Association that, in their opinion, electricity supply undertakings having to be maintained out of revenue, no depreciation or further writing off of capital was necessary when the time allowed was not greater than 30 years, as the equated life of the works exceeded this period. The Association were strongly of opinion that a reserve fund should be formed up to the limit allowed by the Provisional Order, before any contribution was made in relief of the rates. The Council approved of the resolution with regard to no depreciation or writing off of capital being necessary; and as to the formation of a reserve fund, they agreed with the principle of the establishment of such a fund—the amount being within the discretion of the respective local authorities. Mr. Scott added that the Committee had made little profit last year, and had carried it to a reserve fund; and when they had more they would do so again, until the time came to purchase new machinery. The question raised by the Auditor was merely an academic one, and of no value to the city in any shape or form. The report was adopted.

Rhyl's Electric Light Undertaking.

The adjourned inquiry into the application by the Rhyl Urban District Council for power to borrow an additional sum of £11,800

FOREMOST FOR 1903

PURIFIERS & VALVES

(PICKERING'S PATENT).

INCLINED RETORTS

(DIDIER SYSTEM).

WILLEY & CO., LONDON & EXETER.

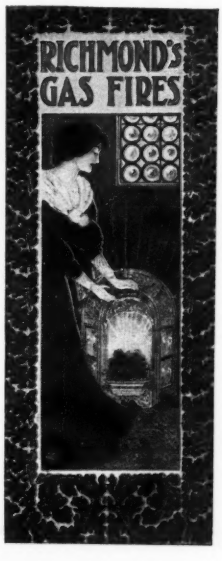
excess of expenditure on their electric light and refuse destructor works, was held last Tuesday by Mr. R. H. Bicknell, M.Inst.C.E. It may be remembered that on the last occasion the Inspector passed some severe strictures on the action of the Council in spending the money without first obtaining the sanction of the Local Government Board, and adjourned the inquiry because certain particulars were not forthcoming. (See "JOURNAL" for Dec. 16, p. 1640). The Town Clerk (Mr. A. Rowlands), who conducted the case on behalf of the Council, said the application as it now appeared before the Inspector was for sanction to a loan of £9567 for electric lighting, and of £2233 for a refuse destructor; making a total of £11,800. The Council decided to amend these figures, but not so as to alter the total loans, as the works formed one scheme. At present, £2000 had been apportioned to the electric light undertaking as the cost of the building; but the town Surveyor (Mr. Goodall), who was the Architect, thought they ought to charge one-half of the cost of the total for buildings (£5135)—viz., £2568—for electric light, and also the sum of £700, being one-half the cost of the chimney and other works. Included in the application was a sum of £1000 for the making of two roads. They wished to amend this part of the application, and treat it as a loan for street improvements rather than for the purposes of the electric light and refuse destructor works. Although the total cost of the electric light undertaking was £25,585, they were not at all despondent, and had great faith in the concern. The Inspector asked the Electrical Engineer (Mr. W. H. Trentham) whether he was aware—when he submitted to him the statement showing the cost of the electric buildings at £2000—of the alteration in the cost which Mr. Rowlands now asked should be made. Mr. Trentham said he was not, and he objected to it entirely. It was bolstering up the refuse destructor at the cost of the electric light works. Had the electric light works been built independently of the destructor, the buildings would not have cost more than £1000. The proposed alteration was unfair and misleading altogether. The Inspector said he did not care whether the apportionment was fair or unfair. He wanted an account showing how the difference in the original estimate was explained. In his original estimate, Mr. Trentham placed the cost of the building at £800. He now admitted that it would cost £2000, and he was prepared to account for that, but Mr. Rowlands turned round and said he must account for a very much larger sum. Mr. Goodall explained that the total cost of the buildings for the electric light and refuse destructor was £5135. The original combined estimate of Mr. Trentham and himself was £1860. The Inspector remarked that this left an excess of £3273 to be accounted for; and he desired that Mr. Goodall should explain this. Mr. Goodall said the excess was due to an increase in the size of the building, additional buildings, rise in the price of material and labour, and extra foundations, also additional paving, the condenser pit, wrought-iron sliding doors, &c. The cost of the addition to the building was about £400. Upon receiving this figure, the Inspector said he would put it down as £800; and he doubled most of the figures supplied under the other headings. In this way £2184 was accounted for; but there was still more than £1000 to be accounted for. How could the Surveyor possibly explain such a discrepancy? Mr. Goodall replied that all he could say was that the cost in the first instance was very much under-estimated. The Inspector said it must indeed have been very much under-estimated. It was obviously a very unsatisfactory estimate, if it could be called an estimate at all. Mr Goodall explained that, when the estimate was first submitted, the plans were not sufficiently advanced to enable him to prepare one. The Inspector advised him not to make any more guesses, as it was both unnecessary and unfair to himself. Mr. Trentham was then called, and explained the reasons why it had been necessary to spend more money upon the plant, &c., as compared with his first estimate. By his original scheme, it was only proposed to lay 2590 yards; but the actual quantity laid was 6189 yards. Mr. W. Elwy Williams stated that when he was a member of the Council he had opposed this expenditure on electric lighting; but his colleagues would not listen to reason. They were electric light mad; and a scheme which was originally to cost £5000 had gone up to £25,000. He thought the thanks of the town were due to the Inspector for the object-lesson he had given the Council at the last inquiry. It was time that expenditure should be stopped in the town. It had only 8000 inhabitants, supported almost entirely by visitors, and there was no sense in laying out £25,000 on a scheme of electric lighting. The Inspector said the money had been spent, and his only difficulty was in getting at the exact items. No doubt the Council would consider it advisable to draw in their horns for the time being. He proposed now to close the inquiry, as he was satisfied with the figures which had been supplied to him. Since he was last at Rhyl, he had ascertained that the District Auditor had called the attention of the Council to the manner in which their accounts were kept, and had reported very much in the way he (the Inspector) had spoken. The inquiry then closed.

WARRINGTON WATER SUPPLY.

Proposed New Reservoir.

The Water Engineer to the Warrington Corporation (Mr. J. Deas) has completed plans for a proposed storage reservoir at Daresbury, and has made a report on the scheme. He points out therein that the present trade supply is derived from the Appleton reservoir, which has not anything like sufficient capacity to store all the water flowing off its own watershed of 520 acres. That reservoir is supplemented by the discharge from a catchwater conduit tapping an additional area of 820 acres of the watersheds of the Daresbury and Hatton Brooks; so that during the winter the supplementary supply merely passes over the waste weir of the reservoir as flood water. The conduit being rather leaky, there is a risk of the supply not being fully available. The Appleton reservoir, constructed with a capacity of 62 million

Cold Weather Returning



February

and

March

are

Coldest

Months.

Therefore

Hire Gas Fires.

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gallons, is much silted up; and as part of the water cannot be drawn off, and the bank is not perfectly sound near top water level, the available capacity does not exceed 50 millions. They are now working above the real capacity of the plant. The Corporation executed an agreement with Sir Gilbert Greenall for the building of a reservoir on the Daresbury Brook, and Mr. Deas recommends the construction of the reservoir for the following reasons: (1) The water to be obtained is particularly valuable for various purposes required by manufacturers, for which Winwick water is most unsuitable. (2) The Appleton works are at present discharging at their maximum capacity, and, with the increase of the town, will soon be unable to cope with the demand; and as the new reservoir will take four years to construct and one year to fill with water, and it will be one year from this date before it can be commenced—making a total delay of six years—it is imperative that extensions of the supply should be made at once. (3) Under the agreement with Sir G. Greenall, the reservoir must be completed by 1907. Mr. Deas adds that if the construction is delayed for any length of time, the Corporation would be put to enormous expenditure for the complete overhauling of the Appleton reservoir, the construction of additional filter-beds, alterations on the distributing mains in the town, and other improvements. The capacity of the proposed reservoir would be about 190 million gallons, and the cost is estimated at £70,000. The Water Committee have resolved that the report and plans should be adopted.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The proposal by the Airdrie Town Council to acquire the undertaking of the Airdrie Gaslight Company was advanced a step on Thursday night. At a meeting of the Town Council, a letter from the Secretary of the Gas Company was submitted, in which the names of five gentlemen were given, any one of whom would be acceptable to the Directors of the Company as sole Arbiter in the transfer, and stating, as the only condition, that the officials of the Company should be retained. The Committee who considered this letter, drafted a reply in which they unanimously agreed to accept Mr. J. M'Gilchrist, of Dumbarton, as sole Arbiter, and expressed the wish that, to save expense, it should be agreed that no witnesses should be called on either side. At the Council meeting, Provost Martyn, in support of the proposal, said that in all his searching he had not come across a single instance in which the taking over of the gas-works had turned out to be a bad investment; but in the majority of cases it had proved to be a great boon to the community. A discussion took place upon the proposal, in which the plea which is now always advanced was put forward—that electricity was to be the light of the future, and that, therefore the Council should not tie their hands in the matter of lighting. But it turned out that in the matter of public lighting the Corporation have tied their hands, so far as electricity is concerned, by giving over their powers under a Provisional Order to a House-to-House Company for forty-two years. It was argued, in support of the proposal, that if the transfer were not made now, the Gas Company would at once proceed with the extension of their works, to meet a rapidly increasing consumption of gas, in connection with which they would double their capital; and that the position for the Town Council lay in this—that while the Gas Company would want to make a 10 per cent. dividend upon their new capital, the Corporation could borrow the money for at least 3½ per cent. The argument is sound, but it is a little specious, as Mr. M'Gilchrist will doubtless take this element into consideration, and the saving will not be in the immediate future. It was stated, as showing the prosperous condition of the gas undertaking, that within the past three years the consumption of gas has increased by 3 million cubic feet, the consumers by 539, the prepayment meters by 390, and the gas-cookers by 330. There are now 580 gas-cookers in use. It was agreed by ten votes to two to proceed with the transfer on the lines indicated by the Committee. It is stated that a plebiscite of the ratepayers may be taken on the subject.

A peculiar question has arisen at Coatbridge. The Town Clerk, on the instructions of the Town Council, wrote to the Secretary of the Coatbridge Gas Company, asking them to supply gas to the public lamps in two new streets. The reply of the Company was submitted to a meeting of the Town Council this week, and was to the effect that they were about to extend their mains to the streets in question, and were willing to supply the gas, but asking the Council to cut the trenches for the pipes. The Council resolved to decline to do this, and instructed the Clerk to write to the Company that as the lamps to be supplied were within 50 yards of the Company's main, they were bound to lay the pipe themselves. I am not aware of having seen the question raised before; but I think the Company are right.

It is a strange proceeding, partaking of the ironical, to find the Corporation of Falkirk this week resolving to petition against an application by the North British Railway Company, in which power is asked, among other things, to construct a railway to Thornhill. This is the site of the proposed new gas-works. The Corporation have been negotiating with the Railway Company for several years with a view to getting this railway constructed, and only recently an agreement was come to by which the Company bound themselves to construct it. Since then the Corporation, as the outcome of the elections, have gone against the scheme of the new gas-works; and the spectacle is provided of their petitioning Parliament to refuse a measure which is being promoted under agreement with them. It is a strange situation.

The lot of the collector of money from prepayment meters is not always a happy one, any more than that of the policeman. At the Dundee Police Court yesterday, Robert Beattie, a labourer, and Robina Kettles, or Mullan, residing in Seafield Road, were brought up on a charge of having committed a breach of the peace on Dec. 22 last. It came out in evidence that two gas officials were on their rounds inspecting

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ARE THE BEST IN THE MARKET

meters and collecting the money from prepayment meters. In one of the houses they encountered the accused, both under the influence of liquor. When the collector took the money out of the meter, the accused declared that they had just put a penny in the slot; and they demanded that it should be returned to them, because no gas had been consumed. The inspector endeavoured to convince them, by the reading of the meter index, that a penny could not have been dropped in recently, and that the sum he had collected was quite correct. The accused would not be convinced. They cursed and swore, and insisted on having the penny. The officials went upstairs to another house; but the accused followed, burst open the door, swore at them, and insisted on having the penny. At last one of the collectors gave the man a penny to please him; but this did not satisfy him. Bailie Robertson found both the accused guilty, and imposed a fine of 7s. 6d., with the alternative of five days in prison, upon each.

I have read to-day of an installation of electric lighting at a farm in Aberdeenshire, which seems to mark a new departure in the lighting of isolated places. It is needless to say that gas lighting would be out of the question in such a place. The tenant of the farm, a Mr. J. C. Thom, is a man of great ingenuity, and he devised the installation himself, and had some of the appliances constructed to his own designs. There is sufficient water power to drive a dynamo; and this apparatus he has had fitted up in the barn. Storage batteries he eschewed as being expensive; his scheme for regulating the current being the simple one of drawing a sluice to allow more or less water on to the wheel, as desired. Instead of copper wire he uses galvanized iron wire, stranded, of such thickness that the current is never of such potentiality as would injure anyone touching it. The wire is carried along under the eaves of the houses, with connections to all the departments, including the dwelling-house. The light is a great convenience. Men going about their duties in the morning and evening have no lanterns to carry with them; they simply switch on the light when they enter a stable or byre or barn, and time is saved by the facility of the movement, as well as by the absence of trimming lamps and carrying them from place to place. Mr. Thom says it is also economical. I mention the circumstance with pleasure, as, apart from the joy there is in recognizing merit, there is no doubt that Mr. Thom has led the way in what is a praiseworthy movement for the improvement of the lot of dwellers in places where comforts are few. I feel it due to the gentleman that I should give his name and address, as others may wish to communicate with him, in order that they may be able to follow his example. It is Mr. J. C. Thom, Quithill, Crathes, Aberdeenshire.

I mentioned recently that the Town Council of Arbroath had resolved to apply to the Board of Trade to allow the Electric Lighting Provisional Order to remain in force—that is to say, to remain in abeyance—until such time as the Council should see their way to go on with the undertaking; this being done in view of their having to face heavy expenditure in connection with the water supply. The reply of the Board was submitted at a meeting of the Town Council on Tuesday, and it was not to their satisfaction. The Board state, with apparent bluntness, that the Order must, without further undue delay, be carried into effect, or it will be null and void. The Corporation of Arbroath are adepts in the matter of delay, and, instead of making up their minds as to what they will do, they instructed the Town Clerk to inquire as to what has been done in burghs of similar size, and to find out as to the success or otherwise of electrical undertakings in them. The trouble, of course, is that while the Corporation, and the community, are content to do without electric lighting, the speculative company promoter will not leave them alone.

The town of St. Andrews, like that of Arbroath, is in a position with regard to its water supply such as has called into action the Local Government Board. At a meeting of the Town Council this week, letters were submitted which had been received from the Board, requesting to be furnished with the views of the Local Authority on the reports by the Medical Officer and the Sanitary Inspector as to the water supply. After discussion, the Council unanimously agreed to appoint a Committee to consider the whole question of procuring an additional supply, and to report. It was resolved to send this resolution to the Local Government Board.

At the meeting of the Carnoustie Town Council last Monday, it was reported that there is a waste of more than 2000 gallons of water per hour. Without a sufficient number of valves, it is impossible to locate the leak, and the Water Manager recommended the provision of these, at an outlay of from £20 to £30. It was stated that £400 worth of water is being wasted every year. The Council resolved to have the valves fitted on the mains, as recommended.

Serious Condition of the Leicester Water Supply.—At the meeting of the Leicester Town Council last Tuesday, Alderman Wood made known the serious condition of the water supply of the town. He said the stock of water in the three reservoirs was 659,832,000 gallons, showing a deficiency from the full state of 719,168,000 gallons, compared with a deficiency at the corresponding time last year of 472,210,000 gallons. From these figures, the Council would see the serious position that the town was placed in. During his connection with the Water Department, he had never known the reservoirs to be in the condition they now were. A recent large rainfall had added some 80 million gallons to their stock, or the figures he had placed before them would have been worse than they were. The fact that there was a deficiency of 240 million gallons more than at this time last year would be felt to be a very serious position for the town, especially when he told them that inquiry had been made in all directions by the Water Committee to obtain a temporary supply before the period arrived when they might enjoy the Derwent water. These inquiries had had very poor results. If they did not have a very large rainfall in the next few weeks, he was sure the outlook for the water supply of Leicester during this year would be of the most serious character.

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WINDSOR ST. WORKS, BIRMINGHAM	2,000,000
SALTLEY WORKS, BIRMINGHAM	2,000,000
COLCHESTER	300,000
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SWINDON (New Swindon Gas Co.)	120,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA.	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000
BURNLEY	1,500,000
KINGSTON-ON-THAMES	1,750,000
ACCRINGTON	500,000
TONBRIDGE	300,000
STRETFORD	500,000
OLDBURY	300,000
TODMORDEN	500,000
SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
YORK (Second Contract)	750,000
ROCHESTER (Second Contract)	500,000
NEWPORT (MON.)	250,000
TOKIO, JAPAN.	1,000,000
PERNAMBUCO (Brazil)	125,000
MALTON	150,000
DULUTH, MINN. (Second Contract)	300,000
BROCKVILLE (ONT.)	250,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 10.

Sulphate of Ammonia.

Supplies have been rather more abundant, but they have readily been absorbed at advancing prices, and the closing quotations are £12 2s. 6d. per ton f.o.b. Hull, and £12 5s. per ton f.o.b. Liverpool and Leith. There has been some direct buying for the Continent and for the Colonies; but the views of Spanish and American buyers are too far below current prices to admit of business, so that the market has been mainly in the hands of buyers who have contracts. In the forward position, makers are firm at £12 7s. 6d. per ton, both in London and in Scotland; but so far this price has not been reported paid.

Nitrate of Soda.

This is firm; but since the December figures were published, the tone of the market has been quiet. Spot prices remain at 9s. and 9s. 3d. per cwt. for ordinary and refined qualities respectively.

LONDON, *Jan.* 10.

Tar Products.

There is very little to report; the markets remaining quiet but steady. In benzol, there is rather more business doing, some quantity of 50-90 per cent. having been sold at 8¾d. for home consumption; but an offer of 10d. was declined for 90 per cent. January-June delivery. Crude carbolic is rather firmer, although prices have not advanced. A fairly good business has, however, been done for January-June, and consumers now seem more inclined to purchase. The prices of crystals remain the same; but there is not very much doing in either quality. Pitch continues very firm indeed, and very high prices are being paid for prompt delivery from London, owing to the very low freights now ruling. Creosote maintains its position, and the demand is decidedly good, especially from London for export; and there is also more business doing in the North. Solvent, toluol, and anthracene are all in a very depressed state; and prices are purely nominal.

The average values during the week were: Tar, 22s. 6d. to 27s. Pitch, London, 58s. 6d. to 60s.; east coast, 56s. to 57s.; west coast, 55s. to 56s. Benzol, 90 per cent., 10d.; 50-90 per cent., 8d. to 8¼d. Toluol, 7¼d. to 8d. Crude naphtha, 3¼d.; solvent naphtha, 8⅛d. to 9¼d.; heavy naphtha, 9d. to 10d. Creosote, London, 1⅞d.; North, 1⅝d to 1½d. Heavy oils, 2d. to 2¼d. Carbolic acid, 60 per cent., 1s. 7d. Naphthalene, 35s. to 55s.; salts, 25s. to 27s. 6d. Anthracene, "A" quality, 1½d. to 1⅞d.; "B" quality, 1d. nominal.

Sulphate of Ammonia.

The market is still firm, especially for forward delivery, in which there is a good business doing. The Gaslight and Coke Company have declined £12 6s. 3d., and will not accept less than 12s. 7s. 6d. for January-April. Another large gas company have sold at £12 5s. for prompt delivery. In Leith, business is reported at £12 5s., and makers now ask £12 6s. 3d. for early delivery. In Hull, a very good business has been done at £12 3s. 9d., for prompt; while £12 5s. is now asked for January-March. In Liverpool, sales are reported at £12 2s. 6d. for prompt; but makers want higher prices for forward delivery.

COAL TRADE REPORTS.

Lancashire Coal Trade.

So far as the inland trade is concerned, business continues only moderate; and notwithstanding the protracted holiday stoppages of the pits—which in most Lancashire districts for the New Year extended pretty nearly over a full week—there is no scarcity of supplies on the market. Here and there collieries have had to fill up out of stock to meet the requirements of their customers during the pit stoppages, but not generally to any large extent; and prices are not more than steady at the quoted list rates. An increasing inquiry for shipment is, however, tending for the moment to strengthen the home market. A considerable quantity of both common round coal and slack is just now being exported; and at the ports slightly better prices are being secured. The house-fire coal trade is rather slow, with best Wigan Arley averaging about 15s. to 15s. 6d. per ton at the pit; seconds Arley and Pemberton four-feet 12s. 6d. and 13s. up to 14s., according to quality, and common house-fire coals from about 10s. 6d. to 11s. 6d. The lower descriptions of round coal are moving away fairly well; but there is no pressure of requirements. A satisfactory feature of the market, however, is that in the Yorkshire district, where the railway companies at this time of the year renew their contracts for locomotive fuel, collieries have been able to hold to, and obtain, the basis prices of last year, averaging 9s. per ton at the pit. In the Lancashire district, ordinary descriptions of steam and forge coal are generally steady at 8s. 6d. to 9s. per ton at the pit. The most noticeable feature of the market is the steady hardening in all varieties of slack, of which there are much less plentiful supplies on the market. This has been due to the limited demand for house-fire coals, and the extended stoppage of the collieries, rather than to any actual increase of demand. Best qualities of Lancashire slack are firm at 6s. 6d. to 7s. per ton at the pit, and medium sorts at 5s. 6d. to 6s. In the commoner slacks, there is very little surplus just now on the market even from outside districts; and prices have been levelling up slightly—4s. 6d. to 4s. 9d. per ton at the pit being now about the minimum quotations. For shipment, 10s. 6d. and 11s., up to 11s. 6d. in some cases, is being obtained for steam coals delivered at the Mersey ports or at the Partington tips on the Manchester Ship Canal. The bulk of the slack being shipped is the commoner qualities, which can be put on board at 6s. per ton, thus escaping the export duty.

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Northern Coal Trade.

With fuller production, there is now a large demand for coals; and the inquiry from the United States having continued, there is steadiness in the price, the full available output being taken up. Best Northumbrian steam coals are firm at about 11s. 6d. per ton f.o.b. Second-class steams vary from 11s. to 11s. 3d. per ton—so much of this class of coal being taken up by the American requirements—and steam smalls are steady at from 5s. 6d. to 5s. 9d. per ton f.o.b. In the gas-coal trade, deliveries are still very heavy, though the largest demand for the season has now been met. The general price for best Durham gas coals for occasional cargoes is still 10s. per ton f.o.b. Some comment is being made on the large contract placed with German collieries by the Paris Gas Company; but the belief still prevails that the superior quality of the Durham gas coal will retain for it a fair share of the contract for that part. The general quotation for gas coke on Tyneside may be put as about 13s. 6d. per ton f.o.b.

Scotch Coal Trade.

There is as yet no official statement with regard to the coal market in Scotland, and no prices are given out. Owing to the year closing in the middle of the week, the total shipments for the year are not available. For the week ending the 3rd inst., they amounted to 215,051 tons—a decrease of 106,671 tons upon the preceding week, but an increase of 7316 tons upon the corresponding period of last year.

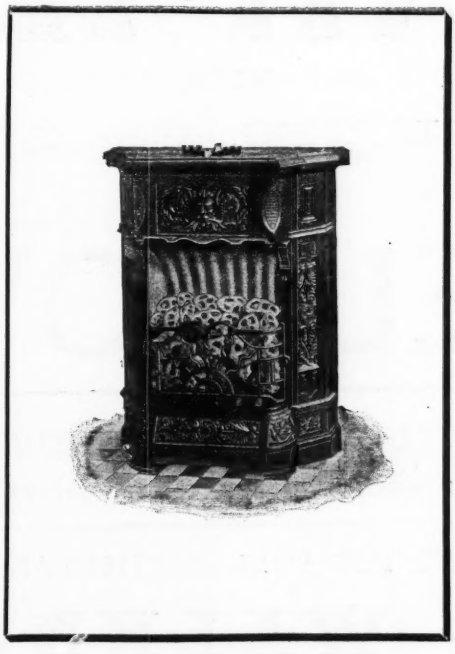
Carlisle Water Supply.—The long expected report by Messrs. James Mansergh and Sons upon the scheme of Messrs. Eaton and Newton, for supplying Carlisle with water from Geltsdale, and upon the position of the city with regard to water supply, was received last Friday week, and submitted to the Geltsdale Water Committee of the Town Council in the afternoon. The report dealt with all the available sources from which Carlisle might obtain a supply of water, including three gravitation schemes—the Geltsdale, a scheme for obtaining water from the Caldew in Mosedale, a short distance from its rise in Skiddaw Forest, and one for obtaining water from Ullswater—together with two projects for utilizing and improving the present supply, which is obtained from the Eden, and is pumped to a reservoir at Harraby, and thence sent into the city mains. Messrs. Mansergh gave estimates of the total cost of these various schemes as follows: Geltsdale, £243,000; Mosedale, £365,000; Ullswater, £276,000; a pumping scheme, with a reservoir at Durdar, £152,000; and a modified pumping scheme with a water-tower, £125,000. They recommend the prompt carrying out of the Geltsdale scheme, the present works being both a discredit and a danger to the city. It may be remembered that Mr. Eaton estimated that the total cost of this scheme would be £119,000, while Mr. Newton reckoned that it would be £130,000. The report has been considered at a special meeting of the Committee.

Electrolysis in Manchester.—It may be remembered that a Special Committee of the Manchester City Council was appointed a short time ago to consider the subject of electrolytic action on gas-mains and service-pipes. They have just received from the Gas Committee a report by the Chief Gas Engineer (Mr. J. Gibson Newbigging, Assoc.M.Inst.C.E.) upon two lengths of wrought-iron service-pipe removed from the ground in consequence of corrosion—one having been in use only 14 months. His opinion is that the corrosion was caused by the action of stray electric currents. The report has also been sent to the Electricity Committee.

Shrewsbury Water Supply.—Mr. C. B. Newton, M.Inst.C.E., has prepared a new scheme for improving the water supply of Shrewsbury. The inhabitants are at present dependent upon the conduit system, which, of course, might break down at any time. The new scheme is for a supply by gravitation from the hills; and it provides for the collection of water from the valley above the village of Picklescott, from the Cothencott Hills, and the Brownhill Valley, and its storage in a reservoir to be constructed in the Brownhill Valley near the village of Castle Pulverbatch, about 6½ miles from the borough boundary. The combined areas of the gathering-grounds proposed to be appropriated aggregate some 2000 acres, and the storage reservoir will be designed to contain about 200 million gallons, or equal to 160 days' supply. The total cost of the works is estimated at £106,939.

The Gas-Works Purchase Question at Wellington (Salop).—A crowded meeting was held in the Wellington Town Hall on Wednesday night to consider the advisability of opposing the Wellington Gas Company's Bill, and promoting one for the purchase of their undertaking by the Urban District Council. Dr. Hollies, the Chairman of the Council, presided. The Chairman having explained the object of the meeting, Mr. J. W. Clift made a long explanatory speech, dealing principally with the financial aspect of the subject. He said he had in his possession returns which showed that municipalities supply gas to communities at a much cheaper rate than private companies, and at the same time make a profit on their undertakings. The average price charged by the former was 3s. 5½d. per 1000 cubic feet, while that of the latter was 4s. 0½d. The mean dividend paid by the Wellington Gas Company was 8⅜ per cent., or £1830; but last year they paid 7⅞ per cent. It was a clever stroke of policy on their part to endeavour to get their capital of £21,000 so raised that it had a face-value of £36,600; because by this means matters could be so adjusted that, instead of their paying a mean dividend of £1830, they could pay £2104. Therefore the Council had a right to oppose the Bill; for if there was a sum of £300 to be divided, it should go into the consumers' pockets. Mr. J. Bayley opposed the proposition, and suggested that the Council, instead of buying the gas-works, should keep before them the electric light. Mr. Howes addressed the meeting in favour of the resolutions passed by the Council, and strengthened the arguments used by Mr. Clift. Mr. Shaw contended that the purchase would the £1000 on the rates. The subject was discussed for some hours, and put meeting then adjourned for a week.

THE
VERY LATEST
DESIGNS
IN
GAS-FIRES



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SYDNEY.

The Discount on Slot-Meter Receipts at Plymouth.—Referring to this new departure by the Plymouth and Stonehouse Gas Company, mentioned in the "JOURNAL" last week, the "Western Morning News" says: "The effect of the reduction in price has a humorous side, since, we suppose for the first time in history, the visit of the gas collector is a red-letter day. This stern and badgered official, instead of being received with indifference and distrust, meets beaming faces and welcome smiles, and even occasional hospitality, as, on opening the meter, he makes the good wife a handsome donation from its contents."

Devonport Corporation and the Plymouth Water Leat.—Some months ago, a dispute arose between the Plymouth and Devonport Corporations in reference to the right of the latter to lay pipes along a road within their own borough. The Devonport Corporation, in extending the gas-mains to the limits of the borough, proposed to pass under the disused Plymouth leat, which crosses the road. The Plymouth authorities opposed them, and the work of laying the mains had to be suspended pending consideration of the legal points involved. Litigation has now been avoided by Plymouth agreeing to sell to Devonport so much of the leat as is beneath the roads in the borough.

Luddenden Foot Gas-Works Extensions.—At the meeting of the Sowerby Bridge District Council last Wednesday, Mr. J. W. Whiteley proposed the adoption of the minutes of the Gas Committee, which contained a recommendation by a Sub-Committee that a new gasholder should be erected at the gas-works at Luddenden Foot; and that the tank of the present holder should be repaired, and a new holder with an additional lift placed therein. The estimated cost was £4500, in addition to which the Sub-Committee recommended that application should be made for sanction to borrow £1000 for other extensions of the works, including the putting in of two additional benches of retorts and new purifiers. It was agreed to adopt the recommendations; and the Clerk was instructed to apply to the Local Government Board for authority to raise £5500 to carry them into effect.

The Hailsham Parish Council and the Gas-Works.—At the meeting of the Hailsham Parish Council last Tuesday, a report was presented by delegates from the Council and the Hailsham Gas Company respectively, who had met in conference on the subject of the acquisition of the Company's undertaking. The Company's delegates intimated that they were prepared to recommend to the shareholders the sale of the property, including all costs, at a maximum price of £4000; the actual sum to be settled either by mutual arrangement or by arbitration. It was stated that the items making up this amount were £2100 of original capital, £900 recently expended on new works, and £1000 for land which the Company propose purchasing and the cost of the Provisional Order. After discussion, the following resolution was passed: "That this meeting agrees to the Provisional Order of the Hailsham Gas Company, on the condition of a clause being inserted giving the Local Authority the option of purchasing the undertaking within three years, on the basis agreed upon at the conference."

Abercarn Gas Supply.—At the meeting of the Abercarn District Council last Tuesday, the Gas Manager (Mr. O. Bowen) reported a continued increase in the consumption of gas, and added that the engine and exhauster were unequal to passing with safety the quantity required, should there be an additional output. It was stated that in the half year ending December last the leakage of gas was 1,737,000 cubic feet, or 25 per cent. of the total make; while for the last quarter it was 379,000 cubic feet, or 11½ per cent. of the 3,217,000 cubic feet made. It was resolved to ask Mr. T. Canning, of Newport (Mon.), to inspect the works, and report to the Council thereon.

Extension of the Broadstairs Water-Works.—In the session of 1901, the Broadstairs District Council purchased from the Water Company the rights and privileges of supplying the district. Mr. Valon valued the concern for the District Council; and, the Company accepting his valuation, the transfer was made under an agreed Bill promoted by the Local Authority. The Council have now decided to extend and remodel their works, and to make further excavation so as to increase the present available supply. Broadstairs and the neighbourhood is a rapidly growing district, and the water supply of a health resort cannot be neglected without the risk of endangering its reputation and prosperity. These works of reconstruction and extension have been undertaken under the guidance of Messrs. William A. Valon and Son, the Consulting Engineers to the Council.

Torquay Water Bill.—A meeting of the owners and ratepayers of Torquay was held last Friday to consider the question of authorizing the Corporation to promote a Bill for the extension of the water-works. The Mayor (Mr. J. Taylor) said that the reservoir which it was proposed to construct would impound two streams, and would add to the quantity available of the pure water on which the reputation of the town from a health point of view so largely depended. The estimated cost was £22,000, which, borrowed for 50 years, would involve an annual charge of £900—an amount which could be covered without in the least degree increasing the water-rent. By the Act of 1856, the town had been prevented from taking any of the water-works profit for the relief of the general district rate. Dr. Last Smith contended that the scheme was absolutely necessary if the town was to derive the full benefit of the purchase of the watershed. As things were, they ran the risk of another authority coming into the valley, as Teignmouth had once proposed to do, and constructing a reservoir to take the water which did not enter the Torquay mains. Two or three ratepayers contended that the scheme was not called for, and that there was not the least fear of a water famine. Alderman Bovey, the Chairman of the Water Committee, said they must secure the town's complete water rights without risk of losing them. The demand for water was increasing, and at the end of five years the consumption would have gone up by 60 million gallons a year. With regard to the necessity for more storage accommodation, it was a fact that at the end of the summer of 1901 there were only 15 million gallons of water available. The resolution authorizing the promotion of the Bill was carried with only two dissentients.

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Fatal Gas Explosion at Strasburg.—According to a Dalziel telegram, there was a disastrous explosion at the Strasburg Gas-Works last Thursday, by which two persons were killed and many injured. Extensive damage was done to property, the windows in every house near the scene of the explosion being shattered, while many of the houses were seriously damaged.

Tests of Southport Gas.—The Gas Committee of the Southport Corporation have resolved that daily tests are to be made of the calorific value of the gas sent out, and the results entered in the fortnightly reports. On the 6th inst. the average result of five testings of the illuminating power of the gas was shown to be 16·39 candles, and it was resolved that an advertisement should be issued calling attention to the fact that the power has been lowered from 20 to 16 candles, that the price has been reduced 4d. per 1000 cubic feet, and that suitable pattern burners can be obtained free of charge on application at the Gas Offices. The Gas Engineer to the Corporation (Mr. John Booth) has been instructed to procure samples of all burners suitable for use with gas of the present power, test them, and report thereon at the next meeting.

Gas Stokers' Wages at Loughborough.—At the meeting of the Loughborough Town Council on Monday last week, the Gas Committee reported that they had taken into consideration an application by the stokers for an increase of wages and the introduction of an eight-hour shift, and had resolved to advance their pay from 4s. 10d. to 5s. per shift, with time-and-a-quarter for Sunday labour—the shifts to be eight or twelve hours, as might be arranged by the Manager in consultation with the men. Alderman Bumpus moved the adoption of the report. He said an eight-hour shift might lead to some of the men being superseded before they arrived at old age, and it was a matter purely of arrangement and of choice on the part of the men whether they worked eight or twelve hours per shift. With regard to the question of Sunday labour, he believed the Manager would endeavour to keep it within as moderate limits as possible. The report of the Committee was approved.

The Accident at the Overton Gas-Works.—We are informed by Mr. J. T. Byrom, the Manager of the Ruabon Water Company and the Rhos Gas Company, Limited, that the account which appeared in last week's "JOURNAL" (p. 54) of an accident which had occurred to the holder at the Overton Gas-Works was incorrect. It was, he says, on Dec. 25, at about 9.15 p.m., during a strong gale, that three of the columns were broken and the holder tilted, and remained in this position until Mr. Byrom got his men to it. The telegraph wires being also damaged, Mr. Hollier, the Manager of the works, bicycled to Ruabon, to ask Mr. Byrom's assistance. Mr. Byrom immediately procured a wagonette, and proceeded to the scene of the accident, taking with him two men and the Secretary (Mr. Whittingham). Their efforts were so far successful that they were able to maintain a partial supply of gas on the following day, while a full supply was available on Dec. 27.

Paris Water Supply.—A project is on foot to increase the water supply of Paris from 74 million gallons daily, the present quantity, to 237¾ millions, by collecting water in the Val d'Orléans, where there is a subterranean lake fed by the River Loire. To convey the water to Paris, an aqueduct 62 miles long will be required; and the cost of the scheme is put at £5,000,000. The estimated population of the city for the present year is 4 millions; and about 60 gallons of water per head is taken as a fair average consumption.

The dividend warrants for both preference shares and debenture stock of the Richmond Gas Stove and Meter Company for the half year ending Dec. 31, 1902, have been posted.

Messrs. W. C. Holmes and Co., of Huddersfield, have received from the Bury Corporation an order for steel hoppers, with girders, columns, &c., in connection with the coke-storage extensions at the gas-works.

We have received from Mr. F. Gelsthorpe, of Derby, a copy of the sheet almanac for the present year issued by the Midland Railway Temperance Union. One corner of it is devoted to statistics of the Railway, from which we learn that the Company have 16 coal and oil gas works, and that the make of gas from these materials last year was 295,808,600 cubic feet and 42,835,900 cubic feet respectively. There were 28,777 incandescent gas-lights in use; and 4597 carriages were lighted by gas. Electric lighting is done by 1910 arc and 13,879 incandescent lamps.

In the "JOURNAL" for the 30th ult., we announced the registration of a Company, with a capital of £50,000, in £1 shares, to acquire and carry on the business of manufacturers of Flavel's kitcheners, &c., carried on by Sidney Flavel, at the Eagle Foundry, Leamington, as Sidney Flavel and Co., and the business of manufacturers of gas and steam cooking, heating, and boiling apparatus, kitcheners, &c., carried on by Messrs. C. E. R. Terry and G. H. Walker respectively, under the styles of the Imperial Stove Company and Radclyffe and Co., at the Old Town Foundry, Leamington, and elsewhere. It may be interesting, in connection with that announcement, to mention that the Flavel range was invented by the late Mr. Flavel in 1828, and called by him the "Kitchener;" and it has been manufactured by Messrs. Flavel and Co. ever since—four generations of the family having been in the business. The firm of Messrs. Radclyffe and Co. was founded in 1854, and was an offshoot of the former. The Imperial Stove Company was started in March, 1901; and, having purchased the business of Messrs. Radclyffe and Co., they commenced the manufacture of gas cooking and heating apparatus. Owing to the rapid growth of this branch of the business, it is intended to transfer the range business of Messrs. Radclyffe and Co. to the Eagle Works; thus leaving the Old Town Foundry in the Warwick Old Road solely for the manufacture of gas cookers and fires and general gas apparatus. The Chairman of the new Company is Alderman Sidney Flavel, J.P.; the Deputy-Chairman and Managing-Director, Mr. C. E. Ryder Terry; and the Managing-Directors are Messrs. G. H. Walker and S. R. Flavel.

THE "ROSLIN"

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AN ARTISTIC AND HIGHLY FINISHED CONDENSING STOVE.

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A new gas-mantle, named the "Triood," has been introduced by a Birmingham firm. A feature is that the neck is turned outwards for about half-an-inch before it is gathered, and the loop inserted in the fabric. It is claimed that greater durability is thus ensured.

The taxed costs in connection with the Bill promoted by the Abercarn District Council to enable them to acquire the undertaking of the Abercarn Gas Company amount to £1926 4s. 9d., in addition to the stamp duty and the taxation fees; making a total of £2010 2s. 1d. The estimate was for £1500; and the difference is attributable to opposition which was not contemplated at the outset.

The district which the North-Western Electricity and Power Gas Company are seeking parliamentary authority to supply, has an area of 2000 square miles, with a population of over 1½ millions; and there are within it 4 county boroughs, 14 boroughs, 48 urban districts, and 31 rural districts. It is proposed to take the power gas over a distance not exceeding 12 miles; while the limit for electricity is 25 miles. The area includes a large number of important towns and manufacturing districts. There will be four generating stations. The capital of the Company will be £1,500,000, with power to issue debentures up to £500,000.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

SITUATIONS VACANT.

ANALYST. No. 3972.
DRAUGHTSMAN. Ramsgate Gas and Water Department. Jan. 17.
DRAUGHTSMAN. Sheffield Gas Company. Jan. 31.
ENGINEER. Sheffield Water Department. Jan. 26.
ENGINEERING ASSISTANT (Water-Works). No. 3965.
EXHIBITION REPRESENTATIVE (Gas Stove). No. 3977.
FOREMAN (Purifying Department). No. 3973.
WATER-WORKS MANAGER. Devonport Water Department. Jan. 23.

SITUATIONS WANTED.

ASSISTANT TO GAS ENGINEER. No. 3966.
GAS OR WATER COMPANY'S OFFICE. No. 3976.
TRAVELLER IN GAS STOVE TRADE. Howland, Faversham.

AGENT WANTED BY GAS-STOVE MAKERS. No 3975.

GAS WORKSF FOR SALE. No. 3978.

PLANT, &c. (Second-Hand), FOR SALE.

GAS-ENGINE (Crossley's 7-Horse Power). No. 3974.
PURIFIERS AND CONNECTIONS. Wright, London.
PURIFIERS, SCRUBBER-WASHERS, GASHOLDERS, AND OTHER PLANT. Firth Blakeley, Dewsbury.
PURIFIERS, WASHER-SCRUBBER, &c. While and Son, London.
RETORT-BENCH FITTINGS. Sheffield Gas Company. Tenders by Jan. 31.

PLANT, &c. (Second-Hand), WANTED.

METERS (DISUSED), BRASS, COPPER, LEAD ASHES, &c. Smith, Bradford.
PURIFIERS. Firth Blakeley, Dewsbury.

SALES OF STOCKS AND SHARES.

ALDERSHOT GAS AND WATER COMPANY. Jan. 27.
BRISTOL WATER COMPANY. Jan. 22.
NEW RIVER COMPANY. Jan. 15.
NEWCASTLE AND GATESHEAD WATER COMPANY. Jan. 20.
SHREWSBURY GAS COMPANY. Jan. 30.
TENDRING HUNDRED WATER COMPANY. Jan. 27.

TENDERS FOR

COAL.

COPENHAGEN. 100,000 tons. Tenders by Jan. 19.

FIRE-CLAY GOODS.

BLACKBURN GAS DEPARTMENT. Tenders by Jan. 24.
SALFORD GAS DEPARTMENT. Tenders by Jan. 22.

PIPES AND CONNECTIONS, &c.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by Feb. 9.

RETORT-BENCH AND IRONWORK.

OMAGH GAS COMPANY. Tenders by Jan. 21.

RETORTS.

BLACKBURN GAS DEPARTMENT. Tenders by Jan. 24.
OMAGH GAS COMPANY. Tenders by Jan. 21.
SALFORD GAS DEPARTMENT. Tenders by Jan. 22.

ROOF PRINCIPALS.

LEEDS GAS DEPARTMENT. Tenders by Jan. 24.

TAR.

BOROUGH OF BOLTON GAS COMMITTEE. Tenders by April 1.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

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All Communications, Remittances, &c., to be addressed to
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

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Wanted, For Sale, and Tender Advertisements, Six Lines and under 3s.; each additional Line, 6d.

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WANTED, at a Gas-Works in the Mid- lands, a FOREMAN to supervise the Changing of the Purifiers.
For further Particulars, apply, by letter, stating Age, Experience, Salary required, and References, to No. 3973, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for a Water-Works, a Me- chanical Engineering ASSISTANT. £150 per annum. Must have a thorough practical and theoretical knowledge of Engines, and be competent to conduct Engine Trials. Must also be a good Draughtsman. Will be required to prepare Plans for remodelling old Pumping Plant.
Apply, by letter, stating Age (not over 30), whether Married, giving full particulars of Scientific Training and Experience in chronological order and *copies* of Testimonials, to No. 3965, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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DRAUGHTSMAN.

WANTED, by the above Company, a thoroughly Experienced DRAUGHTSMAN, well up in constructional work, and accustomed to modern Gas-Works Plant.
Applications, which will be regarded as confidential, must state Age, Training, Experience, and Salary required, and be sent in addressed to the undersigned on or before Saturday, Jan. 31 inst.
HANBURY THOMAS,
General Manager and Secretary.
Commercial Street, Sheffield,
Jan. 10, 1903.

CORPORATION OF DEVONPORT.

WATER-WORKS MANAGER.

THE Corporation of Devonport require a MANAGER for the Devonport Water-Works Undertaking, which is about to be taken over by the Town Council.
Salary £250 per annum, increasing by £10 a year to £350.
Applicants must be between 25 and 40 years of age,
Particulars of the appointment may be obtained from the undersigned, by whom applications must be received not later than the 23rd of January, 1903.
Canvassing members of the Town Council is strictly prohibited.
A. B. PILLING, Town Clerk,
Devonport, Jan. 1, 1903.

WANTED, by a large Firm of Gas- Stove Manufacturers, an EXHIBITION REPRESENTATIVE. Must have had experience in the work.
Apply, by letter, to No. 3977, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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AGENT Wanted by a large Firm of Ironfounders, who have recently started to manufacture Gas-Stoves. An existing connection with Gas Companies essential.
Apply, stating Qualifications, &c., to No. 3975, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Engineer of the Ramsgate Cor- poration Gas and Water Works, requires the services of a thoroughly qualified DRAUGHTSMAN. He must be competent to design Buildings and all kinds of Plant and Apparatus connected with the Manufacture, Purification, and Distribution of Gas. He must also be capable of estimating quantities, and perfect in the preparation of detailed drawings. A knowledge of Hydraulics and Levelling would be an additional qualification.
Applications, by letter only, accompanied by *copies* of three recent Testimonials, stating Age, Experience, and Salary required, to be sent, on or before Jan. 17, 1903, addressed to the ENGINEER, Gas and Water Works, RAMSGATE.

CITY OF SHEFFIELD.
(WATER DEPARTMENT.)

DERWENT VALLEY WATER ACT, 1899.

THE City Council of Sheffield are about to proceed with the construction of a Tunnel for the purpose of conveying Water from the Works of the Derwent Valley Water Board at Lady Bower to the Works of the Sheffield Corporation in the Rivelin Valley—a total length of nearly Five Miles. The work to be designed and constructed under the charge and direction of an EXPERIENCED ENGINEER, who shall reside in the Rivelin Valley or neighbourhood, and devote the whole of his time to his duties under the Corporation, and who shall have daily personal charge of the work, and be responsible for it throughout, and shall do all special work in connection therewith which the Water Committee may desire, the Staff of Assistants, Inspectors, and others being provided by the Corporation, and under the direction of the Engineer.
The Engineer shall consult with the "Consulting Engineer" with regard to all Plans and Designs, and at every step during the progress of the Works, but without thereby lessening his own absolute responsibility, and he shall report direct to the Water Committee, from whom alone he will take directions.
The engagement to be until the completion of the above Works.
APPLICATIONS are hereby invited from COMPETENT ENGINEERS; it being indispensable that Candidates for the appointment should have had considerable experience both in the design and carrying out of similar Works under a Contractor or by administration under a Public Authority.
The application must state Age, Experience, present Position, Salary required, when at liberty, and contain *copies* of Testimonials, and furnish at least two References.
Personal Canvassing will be a disqualification.
Applications to be sent to me not later than Monday, Jan. 26, 1903, endorsed "Rivelin Engineer."
WILLIAM TERREY, General Manager.
Water-Works Office, Town Hall, Sheffield,
Jan. 3, 1903.

WANTED, old Disused Gas-Meters, BRASS, COPPER, and LEAD ASHES for Cash.
J. SMITH, Broker, Canal Road, BRADFORD.

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TO BE SOLD—Purifiers, Two or Four, 10 feet square by 4 ft. 6 in. deep, planed Joints, Connections, and Overhead Girders.
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TOWER SCRUBBERS, 3 ft. 6 in. by 30 ft. and 6 ft. by 30 ft. high, &c.
Six 20 feet square PURIFIERS, 10 ft. and 12 ft. square. Several smaller Sets, including One Set of Four 5 feet square, and others suitable for Test Plants.
4-inch, 6-inch, 8-inch, and 12-inch STATION METERS and GOVERNORS.
GASHOLDERS, 12 ft. to 50 ft. diameter complete, and erected and guaranteed in perfect condition.
ENGINES and EXHAUSTERS, from 2000 to 60,000 cubic feet per hour.
LIVESEY WASHER, with 10-inch connections.
HOLMES PATENT WASHER-SCRUBBER.
CLAPHAM'S PATENT WASHER-SCRUBBER.
All overhauled, refitted, and guaranteed perfect. No reasonable offer refused.

FOR SALE—Nominal 7-horse power "Otto" Silent GAS-ENGINE by Crossley Bros. In good condition. Used only Five Years. With Fly-Wheel, Cooling-Tanks, Gas-Bag and Exhaust-Box complete. Price £50. Inspection by appointment.
Address No. 3974, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

FOR SALE—Very good Gas Plant as under:—
PURIFIERS—Four, 12 feet square, with 8-inch Centre-Valve and Connections. Planed Joints.
Kirkham WASHER-SCRUBBER, 300,000 cubic feet per diem., with Engine and 8-inch Valves and Connections.
Livesey WASHER, 250,000 cubic feet per diem, with 8-inch Valves and Connections.
Photos. sent on application to SAML. WHILE AND SON 60, Queen Victoria Street, LONDON, E.C.

SHEFFIELD UNITED GASLIGHT COMPANY.

SECOND-HAND RETORT-BENCH FITTINGS.

THE Directors of the above Company have FOR SALE the HYDRAULIC MAINS, DIP-ARCH, ASCENSION, and STAND PIPES comprised in ten through Settings of 21 in. by 15 in. Ω-shape Retorts.
The whole of the Plant is at present at work, and in good condition.
Further Particulars may be obtained on application to the Engineer, Mr. J. W. Morrison, at the Company's Offices, Commercial Street.
Tenders, addressed to the undersigned, to be sent in not later than Saturday, Jan. 31, inst., endorsed "Second-hand Fittings."
HANBURY THOMAS,
General Manager and Secretary.
Commercial Street, Sheffield,
Jan. 10, 1903.

OMAGH GAS COMPANY.

TENDERS are invited for the supply and erection of TWO OVENS of RETORTS on the Regenerative Principle complete, with all Bench and Retort Ironwork.
Particulars may be had from the undersigned, with whom Plans and Specifications are to be lodged on or before the 21st inst.
The lowest or any Tender not necessarily accepted.
JAS. BRODIE,
Manager and Secretary.
Gas Office, Omagh,
Jan. 3, 1903.

COUNTY BOROUGH OF BLACKBURN.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for INCLINED RETORTS, FIRE-BRICKS, CLAY, &c.
Forms of Tender and Particulars of Requirements may be obtained from the undersigned, by whom Tenders must be received on or before the 24th inst., endorsed "Tender for Retorts," &c.
By order,
S. R. OGDEN,
Engineer and Manager.
Municipal Offices, Blackburn,
Jan. 5, 1903.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of FIRE-BRICKS, RETORTS, &c., for their various Works.
Full Particulars may be obtained on application to the Gas Engineer, Gas Offices, Bloom Street, Salford.
Sealed Tenders, endorsed "Tender for Fire-Clay Goods," addressed to the Chairman of the Gas Committee, to be delivered to me not later than Three p.m. on Thursday, the 22nd inst.
L. C. EVANS,
Town Clerk.
Town Hall, Salford.
Jan. 6, 1903.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

1550 TONS OF 24-INCH CAST-IRON MAINS.

THE Gas Commissioners are prepared to receive TENDERS for the supply and delivery of about 1550 Tons of 24-inch diameter Cast-Iron Spigot and Faucet MAIN PIPES, in 12-feet lengths, along with CONNECTIONS and SPECIALS.
Contractors may also quote for Pipes to their own patterns, but not exceeding the specified weight.
Deliveries to be in regular weekly quantities as required, commencing at the end of March, and continuing up to the 30th day of September next.
The Pipes to be delivered on the North British or Caledonian Railway Systems, or free on rail at Leith or Granton Harbours.
Specifications, Schedules, and Forms of Tender may be obtained upon application to Mr. W. R. Herring, Chief Engineer and Manager, New Street Works, Edinburgh.
Tenders to be lodged with the undersigned on or before Monday, the 9th day of February, 1903, not later than Ten a.m., endorsed "Tender for Main Pipes."
The Commissioners do not bind themselves to accept the lowest or any Offer, and reserve to themselves the right of accepting the whole or any portion of the material tendered for.
JAMES M'G. JACK,
Clerk to the Gas Commissioners.
25, Waterloo Place, Edinburgh,
Jan. 6, 1903.

LEEDS CORPORATION.
(GAS DEPARTMENT.)

TO ENGINEERS AND IRONFOUNDERS.

THE Gas Committee are prepared to receive TENDERS for the supply, delivery, and erection of Forty ROOF PRINCIPALS required for the New Retort-House at their New Wortley Works.

Drawings may be seen, and Specification obtained, on application to the undersigned.

The Committee do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, addressed to the Chairman of the Gas Committee, Municipal Buildings, Leeds, and endorsed "Tender for Roof Principals," to be delivered not later than Saturday, the 24th inst.

R. H. TOWNSLEY,
General Manager.

Gas Offices, Municipal Buildings,
Leeds, Jan. 3, 1903.

TENDERS FOR GAS COAL.

THE Magistracy of Copenhagen are prepared to receive TENDERS for the supply and delivery of 100,000 Tons of best GAS COAL from the beginning of April, 1903, until the end of December, 1903.

The Magistracy reserve the right to divide the Contracts between two or more Contractors.

Further Information and Conditions for the delivery may be obtained on application to Kjöbenhavns-Belysningsvæsen, Vestre-Boulevard, Köbenhavn B.

The Tenders, sealed and marked "Tilbud paa Kul," to be sent to Magistratens, 4de Afdeling, Det nye Raadhus, Köbenhavn B, before the 19th of January, 1903, Twelve o'clock, at which time the Tenders will be opened in the presence of the parties tendering who are in attendance.

THE MAGISTRACY OF COPENHAGEN.

Dec. 23, 1902.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

TENDRING HUNDRED WATER-WORKS COMPANY.

(Incorporated in 1884) supplying HARWICH, PARKESTON, and the East Coast Resorts of DOVERCOURT, WALTON-ON-NAZE, and FRINTON-ON-SEA, &c.

SALE BY AUCTION OF 500 £10 "A" SHARES, RANKING UP TO 8 PER CENT. DIVIDEND equally with the existing "A" Shares, which have received 4½ PER CENT. FOR THE LAST SIX YEARS.

The Water Revenue has risen from £3900 in 1897 to £6638 at the present time; and this New Capital is required for Works necessitated by the increasing demand for Water, the result of the continued development of the District.

MR. ALFRED RICHARDS will issue the above by AUCTION at the MART, LONDON, E.C., on TUESDAY, the 27th of JANUARY, at Two o'clock, in Lots, By ORDER of the DIRECTORS.

Particulars of Sale, with Form of Instructions for the Auctioneer or Secretary to purchase for Investors unable to attend the Auction, obtainable post free of the SECRETARY OF THE COMPANY, Mistley, Essex; or of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

ALDERSHOT GAS AND WATER COMPANY.

NEW ISSUE OF 725 £10 FIVE PER CENT. "F" PREFERENCE SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Jan. 27, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

NEWCASTLE AND GATESHEAD WATER COMPANY.

SALE OF ORDINARY STOCK.

TO BE SOLD by Auction, in the Board Room of the Company's Offices, Pilgrim Street, Newcastle-on-Tyne, on Tuesday, the 20th of January, 1903, at Half-past Twelve o'clock precisely, by Mr. CHARLES A. JOEL, in such Lots as are provided for in the Company's Act of 1898—

SIXTY THOUSAND POUNDS OF ORDINARY STOCK (ACT, 1898). (MAXIMUM DIVIDEND £7 PER CENT. PER ANNUM).

The above Stock is part of the £7 per cent. Maximum Ordinary Stock created under the powers of the Newcastle and Gateshead Water-Works Acts, 1898 and 1902.

The Dividend is subject to proportionate diminution whenever the Maximum Dividend to which each class of Ordinary Stock of the Company is entitled shall not be paid in full, but such diminution may be made up in subsequent Years. The Dividend paid on the Ordinary Stocks of the Company for the past three years has been as follows:—

On the Original Ordinary £10 per cent. Stock, £8 10s. per cent. per annum.

On the Ordinary £7 per cent. Stock, £5 19s. per cent. per annum.

Printed Particulars and Conditions of Sale may be had at the COMPANY'S OFFICES; and Messrs GEORGE ARMSTRONG & SONS, Solicitors, Newcastle-on Tyne; or of the AUCTIONEER, 66, New Bridge Street, Newcastle-upon-Tyne.

GEORGE SMITH
Secretary and General Manager.

Newcastle-on-Tyne,
Dec. 9, 1902.

COUNTY BOROUGH OF BOLTON.
(GAS DEPARTMENT.)

TENDERS FOR TAR.

THE Gas and Lighting Committee of the Borough of Bolton invite TENDERS for the purchase of the TAR to be produced at their Works during a period of Three Years from the 1st of April next.

Further Particulars and Form of Tender may be obtained on application to Mr. William Walch, Office Superintendent, Gas Offices, Bolton.

Sealed Tenders, endorsed "Tender for Tar," and addressed to the Chairman, Gas and Lighting Committee, to be delivered at the Gas Offices, Bolton, not later than Thursday, the 22nd of January.

R. G. HINNELL,
Town Clerk.

Town Hall, Bolton,
Jan. 12, 1903.

SHREWSBURY GASLIGHT COMPANY.

DESIRABLE INVESTMENT.

THE Directors of the above Company invite TENDERS for sufficient SHREWSBURY GAS CONVERTED ORDINARY STOCK to produce the sum of £14,176.

This Stock is entitled to a Standard Dividend of 5 per cent., payable half-yearly, and the Maximum Dividend has been paid for many Years.

January 30, 1903, is the last day for reception of Tenders.

Forms of Tender may be had on application to LLOYDS BANK, LIMITED, SHREWSBURY, or to the Company's Secretary, from whom any further Information can be obtained.

By order of the Directors,
WM. BELTON,
Secretary.

Gas-Works, Shrewsbury,
Dec. 18, 1902.

NEW RIVER COMPANY.

ISSUE OF £250,000 THREE PER CENT. DEBENTURE STOCK "D."

NOTICE is Hereby Given, that the Directors are prepared to receive TENDERS for the above issue (being part of the £1,000,000 Debenture Stock "D" authorized by the New River Company's Act, 1897), bearing Interest at three per cent. per annum, and redeemable at par at any time after the expiration of twenty-five years from the date of issue, upon six months' previous notice being given by the Company.

Particulars, Conditions of Sale, and Forms of Tender, may be obtained at the Company's Office, Rosebery Avenue, Clerkenwell, E.C.

Sealed Tenders, are to be delivered at the New River Office not later than Ten o'clock a.m. on Thursday, Jan. 15, 1903.

Reserve Price, £97 per cent.

The Stock is a lawful investment for Trustees.

N.B.—On the transfer, pursuant to the Metropolis Water Act, 1902, of the Water Undertaking of the Company to the Metropolitan Water Board, this Stock will, under the provisions of that Act, be secured on the whole Water Fund of the Water Board, and have in addition the security on the rates provided by the Act.

By Order of the New River Company,
JAMES SEARLE,
Clerk.

New River Office, Rosebery Avenue,
Clerkenwell, E.C., January, 1903.

BRISTOL WATER-WORKS COMPANY.

SALE OF ORDINARY STOCK.

MESSRS. ALEXANDER, DANIEL, & CO. will SELL BY AUCTION, at the Bank Auction Mart, Corn Street, Bristol, on Thursday, the 22nd of January, 1903, at Three o'clock in the Afternoon,

£15,000

BRISTOL WATER-WORKS 7 PER CENT. MAXIMUM CONSOLIDATED ORDINARY STOCK,

in Lots of £100, at the Reserved Price of £150 for every £100 Stock.

The above £15,000 Stock is part of the 7 per cent. Maximum Consolidated Ordinary Stock, amounting to £690,000 created under the powers of the Bristol Water-Works Acts, 1888, 1889, and 1895.

The Dividend is subject to proportionate diminution whenever the Maximum Dividend to which each class of Ordinary Shares or Ordinary Stock of the Company is entitled shall not be paid in full, but such diminution may be made up in subsequent Years.

For further Particulars and Conditions of Sale, apply to the AUCTIONEERS, Bank Chambers, Corn Street, BRISTOL; to FUSSELL AND CO., Solicitors, 36, Corn Street, BRISTOL; or to

ALFRED J. ALEXANDER,
Secretary and General Manager.

Bristol Water-Works Office,
Small Street, Bristol.

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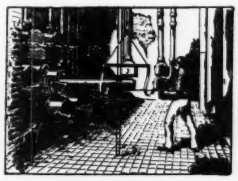

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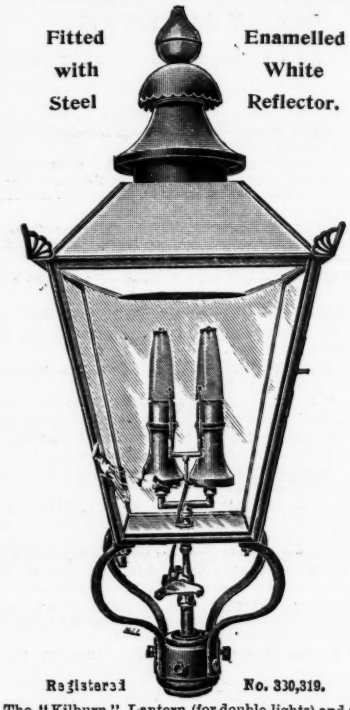
Fitted with Steel

Enamelled White Reflector.



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RETORT OVENS WITH INCLINED RETORTS (COZE SYSTEM)

Erected since 1891, and being worked at, or orders have been received and in hand from, the following Gas-Works:—

Name of Gas-Works.	Number of Benches.	Number of Retorts.	Name of Gas-Works.	Number of Benches.	Number of Retorts.
Altona	21	189	Kiel	10	90
Aalborg	6	54	Ludwigshafen	16	144
Barcelona	14	126	Lübeck	4	36
Basel	11	99	Lynn (U.S.A.)	5	45
Berlin II.	14	126	Malaga	6	54
Berlin III.	15	135	Malmoe	12	108
Berlin IV.	24	216	Mariendorf, Berlin, I. C. G. A.	32	288
Berlin V. (Schmargendorf)	20	180	Mannheim	6	54
Berlin, I. C. G. A.	46	414	Mainz (Maintz)	7	63
Bielefeld	8	72	Muelhausen i. Els.	10	90
Bockenheim, near Frankfort	29	261	Muehlhausen i. Th.	4	36
Bremen	30	270	Mailand (Milan)	24	216
Brooklyn (U.S.A.)	5	45	München-Gladbach (Munich)	8	72
Brüssel (Brussels)	8	72	Pest (Pesth)	15	145
Cassel	17	153	Pest Mineralölfabrik	1	3
Central Union Gaslight Co., New York	6	54	Posen	6	54
Charlottenburg	32	288	Plauen i. Voigtl	4	36
Chemnitz	19	171	Odense	9	72
Coblenz	13	117	Randers	4	36
Darmstadt	12	108	Remscheid	3	27
Danzig	10	90	Rostock	6	54
Dresden II.	14	126	Rixdorf	12	108
Dresden III.	10	90	Stettin	21	189
Drontheim	2	18	Stockholm	24	216
Esslingen	3	27	Strandvej	4	36
Elberfeld	5	45	Trieste	18	162
Frederiksberg	27	233	Winterthur	8	72
Flensburg	6	54	Witten	4	36
Gera	9	81	Wittkowitz	4	31
Genf	7	63	Wien (Vienna)	186	1674
Göttingen	5	45	Zürich	32	288
E. & J. Gutmann, Wien	2	6	Berlin-Tegel	40	360
Haag (The Hague)	9	81	Nürnberg	32	288
Haarlem	12	108	Plymouth	8	72
Hamburg, Billwärder	24	216	St. Gallen	6	54
Heilbronn	5	45	Total	1091	9787

The Weiss-Zurich and Rothenbach-Bern Patent **Coal-Storage Machinery.** The De Brouwer Patent **Coke Conveyor.** The Drory and Riegel Patent **Charging Apparatus.** The Burgmann Patent **Self-Sealing Expansion Joints** for **Ascension Pipe Sockets. Mouthpieces,** with self-oiling eccentric levers. **Mouthpieces,** with baffle-plates and insulation for reducing the radiation of heat on inclined retorts. **Ascension-Pipe Stopper,** for the prevention of explosions in retort-ovens.

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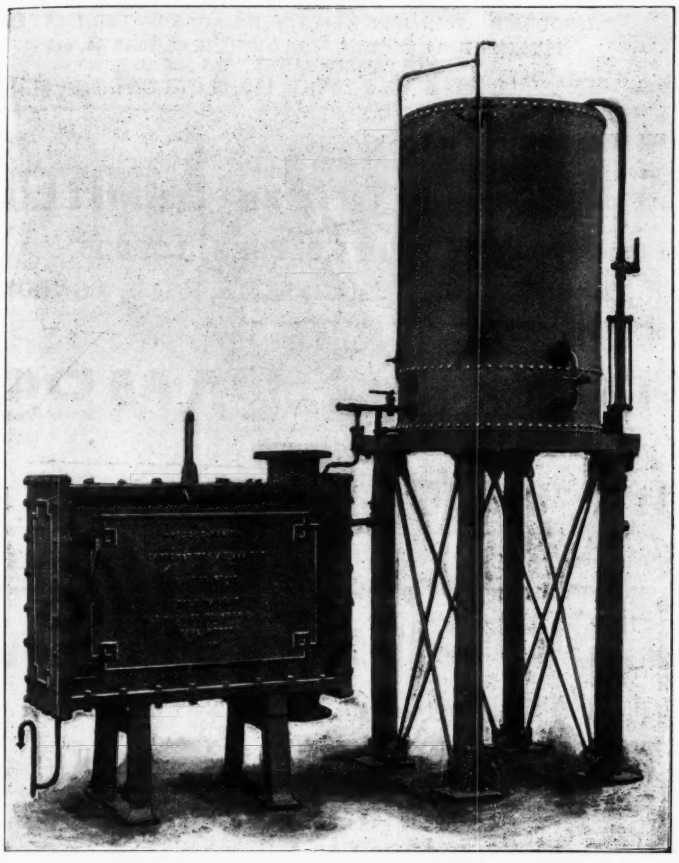

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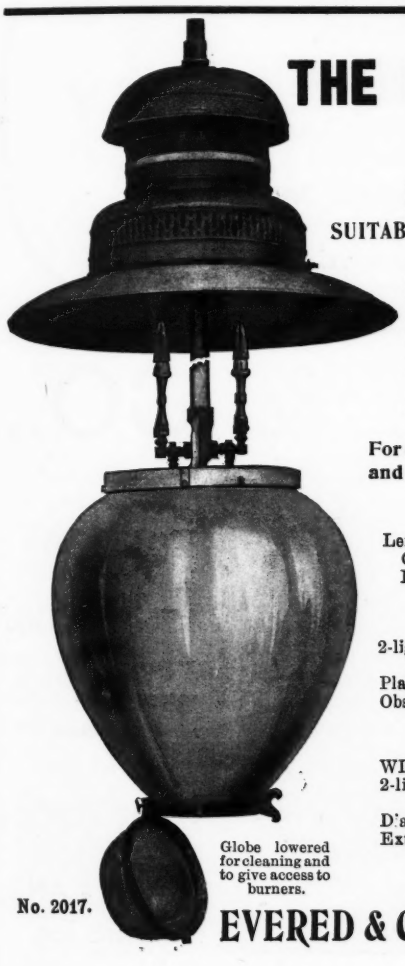

Globe lowered for cleaning and to give access to burners.

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This Lamp is artistically enamelled in fawn colour, and relieved with gold and white lines. It is made with a new method of lowering the globe, which gives easy access to the burners, and is fitted at bottom with a glass bowl and hinged and self-locking ring. It is also fitted with taps to turn off the gas, if required, and is suitable for the ordinary "C" pattern (with or without bye-pass, and lever and chains) or "Kern" Burners.

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Length over all—2 or 3 light .. 30 in.
Globes .. .. 15 in. diameter.
Reflector .. .. 20 in. ,,

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2-light .. 52s. 6d. 3-light .. 58s. 6d.
EXTRA GLOBES. EACH.
Plain Clear—2 or 3 light.. .. 9s.
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Burners extra.

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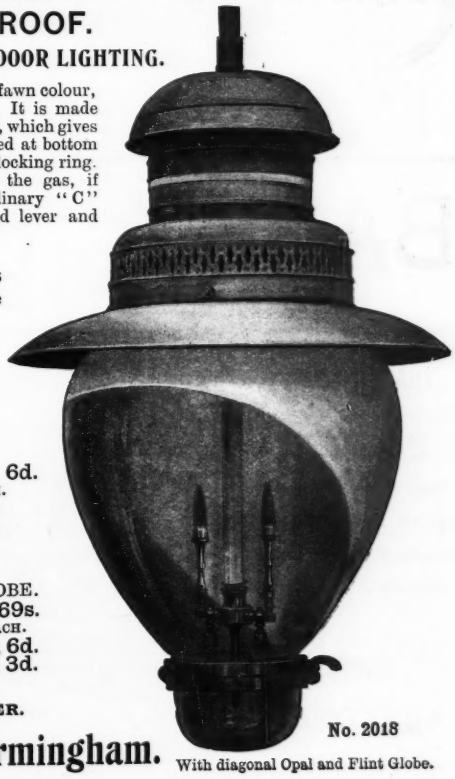

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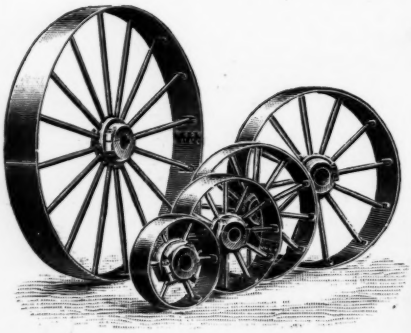

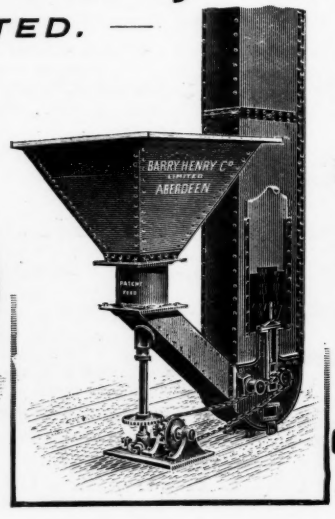

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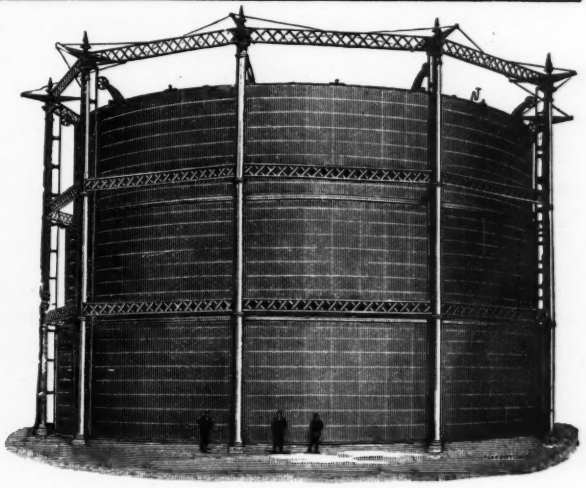

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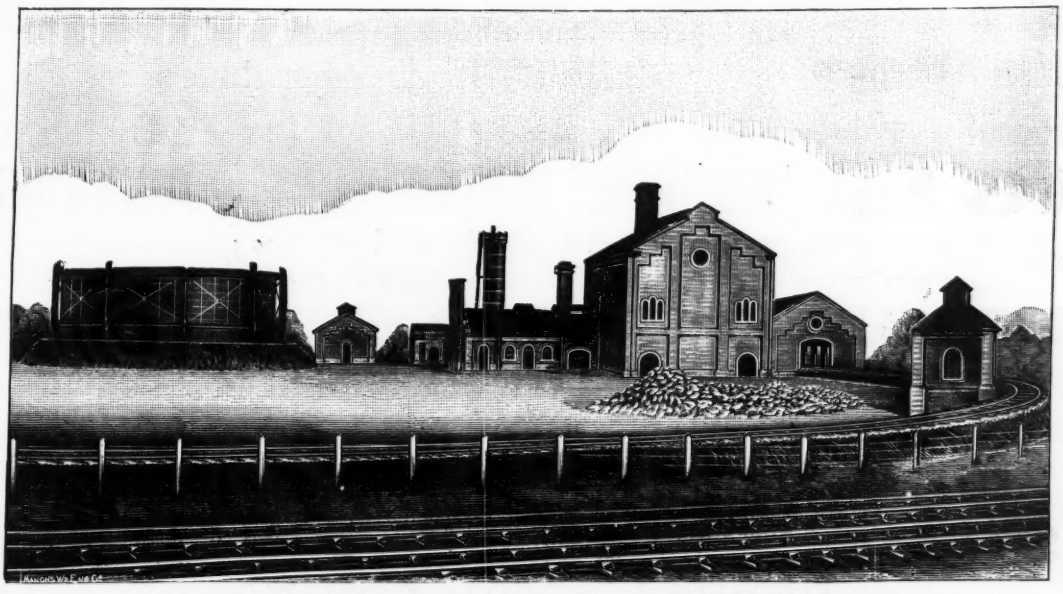

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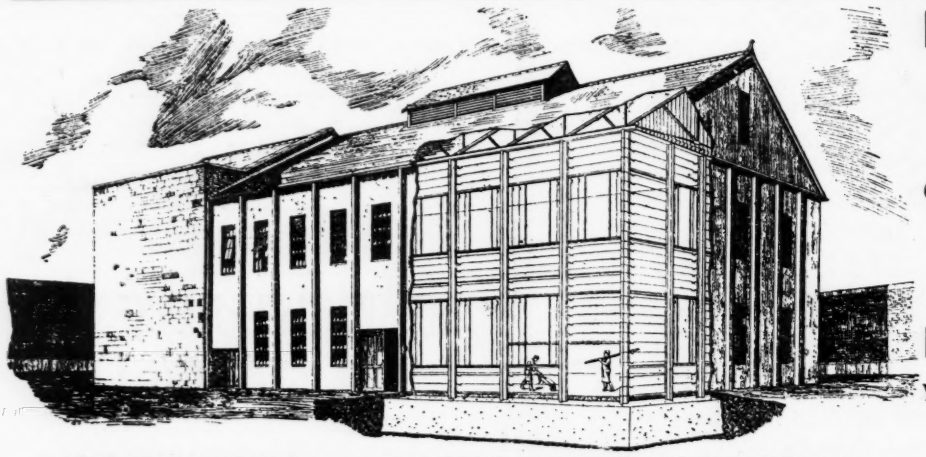

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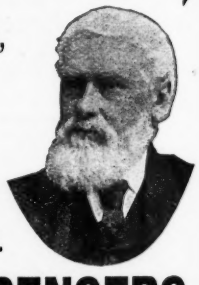

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